ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LV, NO. 13. CHICAGO, SATURDAY, SEPTEMBER 25, 1909. ISSUED WEEKLY

BY THE
ELECTRICAL REVIEW PUBLISHING COMPANY.
CHARLES W. PRICE, President and Treasurer.
A. A. GRAY, General Manager. H. S. TUTHILL, Secretary.
C. W. FORBRICH, Assistant Treasurer.

PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO.

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood.

EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall.

Editors:
CHARLES W. PRICE. A. A. GRAY. F. H. BERNHARD.
Associate Editors:
H. FARRINGTON. J. M. C. HAMPSON. H. EHRLICH.

SUBSCRIPTIONS.

One Year, United States	$3.00
One Year, Canada	4.00
One Year, Foreign Countries	6.00
Single Copy, 10 cents. Back numbers, beyond one month, each	.25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIAL:
The Worcester Appeal ... 571
Electricity for an Awakened Nation ... 572
Electric Power for Industrial Purposes ... 573
Second Annual Convention of the Pennsylvania Electric Association ... 574
American Manufactures to Europe ... 578
Canada's Exports of Electricity and Natural Gas ... 578
Electric Supply of a Scottish Coal-Field ... 578
New York's Illuminations ... 582
Standard Oil in Columbia Gas and Electric ... 582
Western Electric's Position ... 582
American Institute of Electrical Engineers ... 582
Meeting of the Chicago Electric Club ... 583
Rate of Helium Production from the Complete Series of Uranium Products ... 584
Electric Lights to Flash Fire Alarm ... 584
New England Section, National Electric Light Association ... 585
Autumn Meeting of the American Physical Society ... 586
International Association of Municipal Electricians ... 587
Fulton Exhibit at the Engineering Societies Building ... 588
CENTRAL STATION PRACTICE:
Rise of Generator Capacity ... 589
A New Battery-Charging Device ... 591
Electrical Sterilization of Drinking Water in Dwellings ... 591
INDUSTRIAL POWER:
Electric Hoist for Handling Pier Cars ... 592
Southern Expansion ... 592
Switchboard for Group Electric Drive ... 593
Protecting Underground Cables in Collieries ... 593
Extended Uses of Electricity on Board Ship.—I ... 594
ELECTRIC LIGHTING AND ILLUMINATING ENGINEERING:
The Absolute Standard of Light ... 595
Convention of Car-Lighting Engineers ... 596
Special Street-Lighting Projects ... 596
Convention of the Illuminating Engineering Society ... 597
A Concrete Case of Tungsten Economy ... 597
Metal-Filament Lamps in England ... 598
Navy Department Supplies ... 598
Meeting of Central Electric Accountants' Association ... 598
ELECTRICAL ADVERTISING AND SELLING:
Follow-Up System of Advertising ... 599
Testing Advertising ... 599
Central Station Advertising ... 600
FINANCIAL REPORTS OF ELECTRICAL COMPANIES ... 601
INDUSTRIAL SECTION:
Bissell Sewing-Machine Motors ... 602
Electric Shaving and Massage Mirror ... 602
Examples of Individual Motor Drive ... 603
Steam Turbine in the Textile Industry ... 603
New Line of Industrial Staples ... 603
The Triumph Electric Company's New Factory at Cincinnati ... 604
Composite Telephones Provide Additional Facilities ... 606
An Electrically Driven Rail Bender ... 606
Some Westinghouse Contracts for Japan ... 606
Lumber Cars Run by Electricity ... 606
A New Galvanometer Protecting Device ... 607
Large Electric Shining Hoist ... 607
What Constitutes a Good Lubricant? ... 608
CURRENT ELECTRICAL NEWS ... 609
RECORD OF ELECTRICAL PATENTS ... 616

Copyright, 1909, by Electrical Review Publishing Co.

THE WORCESTER APPEAL.

During the past fortnight there was heard the second appeal to the Gas and Electric Light Commissioners of Massachusetts from franchises for the distribution and sale of electric power granted to the Connecticut River Transmission Company. In this case the appeal was made by the Worcester Electric Light Company from a grant of the Worcester aldermen authorizing the Connecticut River Transmission Company to supply any consumer of electricity in that city whose motors and other apparatus connected for use is of rated capacity of not less than fifteen horsepower, and whose annual consumption shall be not less than 22,500 horsepower-hours.

As previously noted in the REVIEW, the commissioners decided in the Fitchburg case that the Connecticut River Company might supply electricity in that city to any customer whose motors and apparatus connected for use shall be of an aggregate rated capacity of not less than 300 electrical horsepower, and whose annual consumption shall be not less than 450,000 horsepower-hours. This decision on the Fitchburg appeal annulled the provision in the grant by the aldermen of that city that the Connecticut River company should not refuse to deliver electricity for power or manufacturing purposes to any applicant for the sole reason that he was a small user.

In the Worcester hearing, it appeared on behalf of the Connecticut River company that its power is generated at the hydroelectric plant on the Connecticut River at Vernon, Vt., where the present capacity amounts to 12,500 kilowatts, made up of five units rated at 2,500 kilowatts each. Three three-phase transformers of 5,000 kilowatts each increase the voltage to 66,000 for transmission, and the lines now run to Gardner, Fitchburg, Clinton, Leominster and Worcester, and power is being delivered in the first three of these places. At Worcester a substation is being constructed, and the Connecticut company will be ready to deliver power there within thirty days. The power house at Vernon is designed for eight of the 2,500-kilowatt generators, or a total capacity of 20,000 kilowatts.

Two three-phase circuits are planned to enter Worcester on steel towers and to reach the substation there partly over private land and partly over public streets, and these circuits will operate at 13,500 volts. It is the preference of the Connecticut River company to supply consumers with apparatus of 100 or more electric horsepower capacity, and it does not wish to supply consumers with only fifteen horsepower, as mentioned

in the grant of the Worcester aldermen. For consumers that take 200 to 300 horsepower the Connecticut River company expects to make lower rates than the Worcester company is able to do, and it is thought that as many as fifteen consumers in Worcester will take 300 horsepower each. The opinion for the Connecticut River company was that it would not be seriously damaged if the minimum limit for its supply to one consumer was put as high as 300 horsepower. On the part of the American Steel and Wire Company, there was expressed a strong desire for the power of the Connecticut River company for use in an electric furnace that will make high-grade steel.

The Worcester Electric Light Company objects to any sales by the Connecticut River company to consumers of less than 300 horsepower, but if this limit is fixed the Worcester company will permit the use of its conduits on a reasonable basis to reach the large consumers. At present the station capacity of the Worcester company for power business is 4,700 kilowatts, and it has a maximum power load of 500 kilowatts, which will be increased to 1,000 kilowatts in about four weeks. This increase of load will include two consumers that require 300 horsepower each. On September 1, 1909, the Worcester company put into effect a new schedule of power rates that range from six cents per kilowatt-hour below 150 kilowatt-hours per month down to three cents per kilowatt-hour for 5,500 to 6,500 per month, and down to two cents for 25,000 kilowatt-hours or more per month. These new power rates are said to represent a reduction of twenty-five per cent from those previously in force.

ELECTRICITY FOR AN AWAKENED NATION.

History is the organized record of yesterdays into logical sequences which show in true perspectives those occurrences as a guide to similar actions in the future, but collections of events in chronological order are annals, not history, and serve only as a useful basis from which history can be compiled.

Patrick Henry's declaration, "I know of no way to judge the future except by the past," gave in few words the purpose of history which has justified the devotions of many learned men and the applications of vast sums of money in keeping true records and building many libraries throughout civilization.

The barbarian operates on different lines. When Omar, with the remark, "If the books are contrary to the Koran, they are pernicious and should be destroyed; if they are in harmony with the Koran, they are redundant, and therefore useless," ordered the Alexandrian Library burned, he made a declaration satisfactory alike to his mind and his conscience.

Under such conditions of historical precedent, it is somewhat unexpected that a recent occurrence of contemporaneous history in the center of Islam should indicate an awakening of the Ottomans to modern civilization.

When as Mehemed V the new Sultan returned to his palace from the Chamber of Deputies, where he had been invested with the sword of the Prophet, he is reported to have sent for those who understood the appliances of civilization, and at the first said: "I have heard and read that there are machines which can be put into houses by means of which one can talk to people too far off to be seen, and I want them." Of course, he referred to telephones, which were generally forbidden in Constantinople, and the few in the city at the time were owned by foreigners.

Abdul-Hamid, the deposed Sultan, it is true, used the telegraph unsparingly and practically governed the Turkish Empire through his private telegraph office in the Yildiz Kiosk; but he despised everything "European," that is, foreign, and if his counter-revolution in his own favor had been successful his orders to the soldiers were to kill every Turkish man, woman and child having European or foreign affiliations or found in the foreign quarters of Constantinople.

The new Sultan is different. He is an Oriental and a Turk, but he believes more or less in general progress. At any rate, he does not seem to want to confine the conveniences and inventions of civilization exclusively to himself.

The new Sultan's attitude is more than interesting; it means that this partial awakening of a great nation will open the way for a large amount of electric appliances throughout the Ottoman Empire.

Although the peasantry of the various races which populate this land are poor, yet the rulers, merchants, and nobility, who are in much the same relation of dominance over the common people as were the feudal barons in Europe 500 years ago, are rich and luxurious in their oriental magnificence.

As the returning crusaders gave to England and Europe many of the comforts of life, from ideas which they had obtained from the oriental luxury of the Saracens, so it is now the opportunity for the western civilization to return the gift by availing themselves of the forthcoming opportunity for a profitable commerce in electrical appliances of all descriptions.

Under the free list of the new Tariff Law, paragraph 647 reads as follows: "Philosophical and scientific apparatus, utensils, instruments and preparations, including bottles and boxes containing the same, specially imported for religious, philosophical, educational, scientific or literary purposes."

Dr. E. P. Hyde has recently imported for the research laboratory of the National Electric Lamp Association several specially designed scientific instruments, and it appears that a fine point is raised concerning whether these should come in duty free or not. The laboratory is certainly scientific, its nature is philosophic and its results are unquestionably educational in the highest degree.

For the great good which is being accomplished through the work which the laboratory is doing, everyone interested in lamp development and in the utilization of light is profoundly grateful. And it seems only reasonable that Dr. Hyde should receive the benefit of the kindliest literal interpretation of the clause above quoted.

ELECTRIC POWER FOR INDUSTRIAL PURPOSES.

To state broadly that electric power will gradually supersede all other forms for industrial purposes, would probably be as incorrect as to state that automobiles will supersede horses for all purposes. That power in the form of electrical energy will supersede other forms in a great many directions is very evident. The great value of electric power lies in its flexibility as well as in its efficiency.

Contrary to the erroneous but popular impression electricity is a transmission medium only. The custom of referring to electricity in the loose manner so frequently done has caused non-technical readers to assume, perhaps unconsciously, that electricity is a prime mover. That this is not the case should be evident to anyone who has ever given the matter thought, even though they have never had technical knowledge nor mechanical experience. Its general adoption is because of its convenience and superiority over belts, shafts, ropes, etc., as a power transmission medium.

It has been possible to effect great economies in many lines of industries because of the ease in determining the exact amount of power used for various purposes through the use of electrical devices. It frequently happened in the old days that the amount of power required for driving a machine shop, for example, could not be determined within twenty-five to fifty per cent until after the apparatus was installed and placed in operation. This meant that, as often as otherwise, the power plant was too small, and then additional boilers and engines had to be installed later. The possibility of using portable machine tools is in itself a very valuable result of the adoption of electric power for manufacturing purposes, in a great many cases. This is especially true in large electrical establishments, where it is actually cheaper to move certain of the machine tools to the work than it is to move the work to the machine. This is often seen in the application of two or three portable devices such as vertical planers and slotters, drills, grinders, etc., to work on one large generator frame, the frame being bolted to the iron floor and the tools located to suit the work.

Another benefit from the use of electric power for industrial purposes has been gained by the more progressive manufacturers by the placing of recording electrical instruments in the office of the superintendent or works manager. These devices keep an accurate record of the amount of power consumed by the motors driving the principal machine tools, or groups of small tools, and is a direct index of the amount of work done and consequently the earning value of both tools and workmen. The result of this system causes the foreman to keep both tools and men busy as much of the time as possible, with a consequent reduction in the cost of manufacture. This system has also eliminated a great many misunderstandings between the shop and the management, because the record is permanent and indisputable.

Another notable result of the adoption of electricity for industrial purposes is the provision now made by practically all machine tool makers for the attachment of motors to their product. A glance at the advertising pages in the mechanical trade journals will show motors attached to a large percentage of tools advertised therein. The development of motor controlling devices has been very rapid and has helped in the adoption of electric power for industrial purposes. As an index of the increased use of electricity for motors, as well as lights and other devices, might be mentioned the increasing number of breweries, water works, cement plants, wood-working establishments, foundries and shipyards, which have adopted this form of transmission for their power.

The use of electrically-controlled lifting magnets in foundries, steel mills, shipyards, railroad yards, structural steel works and stock rooms, etc., has increased a great deal during the past few months, and numerous notable installations have been described. The extreme simplicity, convenience and reliability of these devices is remarkable, considering how many years passed between the discovery or invention of the electromagnet and the development of the practical commercial device of today.

The increasing use of electric motors as well as electric lights in foundries is also worthy of note. This is one field that the compressed-air devices have practically monopolized for a great many years, but now foundries use motors for driving their blowers, tumblers, hoists and grinders, as well as for driving the various machines in their pattern shops. The development of the flaming arc lamp has also been of special value to foundrymen because of the great penetrative ability of the rays of light from this device.

The use of motors for driving machine tools has increased for various reasons. Among them might be mentioned economy of power; increased production due to ease of control of speed, and convenience of handling; better arrangement of tools in the shop; the fact that the power is always ready at any place; decreased losses in transmission over line shafting and belts, and the ability to determine accurately the amount of power required for each tool under various operating conditions. This matter of knowing the exact amount of power required has undoubtedly assisted greatly in the satisfactory application of high-speed tool steel, and this is but one of many illustrations of the great value of the use of electric power for industrial purposes.

T. C. MARTIN, PERMANENT SECRETARY, NATIONAL ELECTRIC LIGHT ASSOCIATION.

Announcement is made of the retirement of T. Commerford Martin from active work as an editor of the *Electrical World,* and his assumption of the distinguished post of permanent secretary of the National Electric Light Association. Mr. Martin brings to this position a rare combination of natural tact, experience, and possession of the confidence of a host of men in every walk of electrical life. For over a quarter of a century he has been busy, in a most intelligent, earnest way, helping to build up the empire of electricity. His opportunity for good work in the new position is unlimited and he will prove a tower of strength to this great organization.

Second Annual Convention of the Pennsylvania Electric Association.

The second annual convention of the Pennsylvania Electric Association was held at The Forest Inn, Eagles Mere, Pa., on September 8, 9 and 10. In view of the fact that this association was only organized last year, the size of the attendance and the amount of business transacted were noteworthy. The association was organized at Eagles Mere last September, as the first state section of the National Electric Light Association, with forty-one Class A members, no Class B members and six associate members. President L. H. Conklin, of Scranton, in his opening address, stated that there are now enrolled seventy-two Class A members, 235 Class B members and fifteen associate members. There were about 200 present at this convention as against eighty-five last year, and the sessions themselves were very well attended. Most of the members gathered at Eagles Mere on Tueslay evening, when there was held a reception and dance in the amusement hall.

WEDNESDAY MORNING SESSION.

The first session of the convention was held on Wednesday morning at 9 o'clock, opening with the roll call and reading of the minutes. President Conklin, in a very able address, welcomed the members and guests, reviewed the growth of the association in the past year and congratulated the members on the fact that the association in its first year had actively participated in the work of the member companies. A great many appeals have been made to the officers of the association for information and assistance of one sort and another, and they have been able through the active co-operation of the members to exercise the real function of an association.

Then followed the reports of the secretary and treasurer, reports of the committees on by-laws and overhead line construction.

The report of the latter committee was made by Thos. Sproule, of Philadelphia, chairman. The report was printed and presented as a special guide to the Pennsylvania companies in the application of the recommendations made in the report of the similar committee to the National Electric Light Association at the Atlantic City convention last June. It was felt that these National Electric Light Association data could be made particularly useful to Pennsylvania companies, if those portions applying to the special conditions in that state were discussed and, if need be, revised. The national committee expects to conclude its work this year after considering such suggestions and to submit its final report in pocketbook form to the next national convention. The report as completed so far is confined to street-lighting circuits and to constant-potential circuits up to 2,300 volts.

In discussing the report of the committee on overhead line construction, R. S. Orr, of Pittsburg, said that the importance of standardizing material could hardly be exaggerated, as it unquestionably led to better material and better prices. He recommended the continuation of the work by the present committee.

E. B. Greene, of Altoona, in speaking of his experience with poles, stated that he considered second growth chestnut most satisfactory. On account of the difficulty he had had in securing poles, he has made it a practice to buy the poles a year in advance and allow them to weather, piled up on skids so as to be raised off the ground. He finds that the weathered poles give twice the life of the green poles.

E. F. McCabe, of Lewistown, said that he had found that poles cut in February are far superior to those cut at other seasons of the year, as at that time they are entirely free from sap. He makes use of white pine cross-arms that are air-dried and, before putting them into service, fills up all cracks and holes with putty and gives them a coat of white lead.

Mr. Camp, of Philadelphia, gave as his experience, that the kind of pole which gives the best service depends largely on the nature of the ground. He has found chestnut poles superior in some localities, while in others Michigan pine, Maine cedar or Georgia pine poles were more lasting. Great interest was shown in the subject of poles, and there was a strong sentiment in favor of further investigation on the part of the association.

In addition to the regular programme, a list of "Pertinent Questions" had been prepared and distributed among the members. These were considered in connection with the papers on similar topics. Question No. 4 was: "Have any of the member companies experimented with or do they know anyone who has used concrete poles for electric lighting pole line?"

R. S. Orr, of Pittsburg, stated that the Allegheny County Lighting Company has done considerable experimenting with concrete poles with very good results. This has been largely the reinforcing of partly decayed poles. Mr. Orr figures that he can reinforce a thirty-five or forty-foot pole for about $3 per pole, which effects a very considerable economy. He expects to adopt concrete poles as standard for replacing of decayed timbers.

Mr. Scroll, of Philadelphia, said that he regarded the cost of transportation and the hauling and handling of concrete poles as prohibitive.

Mr. Orr asked for the experience of the members with iron cross-arms, and a general discussion ensued. A great deal of interest was shown in the subject, and it seemed to be the sense of the convention that the use of iron cross-arms under ordinary conditions introduced an element of danger and weakness; that the lightning hazard and the danger to linemen working on live lines made the advisability of their use questionable.

At this point and before continuing the regular programme, President Conklin introduced President Frank W. Frueauff, of the National Electric Light Association, who was in attendance the first day of the convention. Mr. Frueauff was very warmly received.

In his address to the convention he expressed great gratification at the large attendance and the very earnest interest displayed. Mr. Frueauff made a strong appeal for co-operation with the national association and outlined the mutual advantages which would be obtained. He announced the appointment of a committee of the national body to report on the preservation of poles and cross-arms, a subject which had already been discussed at the meeting. The national association has also appointed a committee on "terminology" and has taken steps to secure the introduction of standard tables of electrical units in the text books of schools and colleges. The committee is also looking into the best methods of resuscitation. Methods in vogue in Europe differ materially from the practice in this country, and the national association expects to cover the matter fully at its next convention. The public policy committee is also studying the effect of the new tariff bill on depreciation of figures in various departments, and he urged the Pennsylvania Association to take this matter up and, if possible, become authority on the subject. Mr. Frueauff announced that on October 1 T. C. Martin, well known to the electrical industry, will become permanent secretary of the National Electric Light Association, to devote his entire time to the service of the member companies.

A standing vote of thanks was extended to Mr. Frueauff, and several of the members personally expressed their appreciation of his interest in the welfare of the Pennsylvania association. E. T. Penrose, of Tyrone, announced that he had compiled a considerable number of power data charts similar to those which appeared in his paper on "Power" and tendered them to the National Electric Light Association for use in future editions of its handbook. Mr. Frueauff accepted the offer, and invited any of the members to contribute along similar lines.

The paper on "Steam Heating in Connection with Central Stations," by Paul Mueller, of Erie, was read by M. J. Fo-

garty, also of Erie, as Mr. Mueller had been unable to reach the convention.

The best practice of steam heating, in the opinion of the author, is a system in which the exhaust steam from the plant will meet the average demand in ordinary weather, live steam being used to supplement this whenever necessary. It is advisable to organize a steam-heating company, and merge it with the central-station company, when the latter decides to start a steam-heating system. The method of constructing the mains was given in detail, as were also the various kinks to be noted in laying out the installation. Services to buildings should be installed at cost. Meter rates are preferable to flat rates. Figures for both of these were given for typical installations. Some details were introduced of the condensation meter and the methods of its installation and supervision. A list of advantages to customers, with an illustrative example of a typical plant, concluded the paper.

This paper called forth a very spirited discussion. James E. Pyle, of Westchester, does not believe in the company doing the steam fitting. In Westchester the local steam fitters set the meters, make connections and do all construction work, and he finds that they lend the company very active support.

Mr. White, of Renovo, said that he has operated his steam plant for eight years, and that better results were obtained when the company took care of all construction work itself, both inside and out, as he had found that local steam fitters could not be trusted. His plan operates with a back pressure of about three pounds.

A motion was passed that a committee be appointed to investigate and report on the subject of steam heat at the next meeting of the convention.

The session was concluded with the reading of a paper by A. R. Cheyney, of Philadelphia, on the subject of "Plant Economy with Special Reference to the Boiler Room."

Starting with the assertion that in the best modern steam plants a thermal efficiency of only from eight to twelve per cent is attained of the energy in the fuel to the main station busbars, the author proceeds to discuss means for increasing this efficiency. Reference is made to the many excellent bulletins published by the United States Geological Survey on topics directly affecting this question. Attention is drawn to the necessity of so improving the apparatus and instruments for indicating and recording the performances of the furnace, etc., that they may thereby be correctly analyzed and brought to the highest perfection. The supervision of the boiler room and its attendants are given, with the aid of charts for proper organization and the conducting of tests. Instructions are given at some length and with due regard to the best practice, for the proper precautions to be observed in order to obtain the best results from the fuel and apparatus used. The subject of buying coal on a heat-unit basis is then taken up, with reference to government bulletins on this subject. The question of the proper choice and treatment of feed water, with especial regard to its scale-forming proclivities, is discussed at length and approximate analyses of certain waters are given, with remarks on their proper chemical treatment. The relation between gas temperature, heating surface passed over, and the amount of steam generated, is considered, with the aid of diagrams; also the losses in combustion due to excess of air above a theoretical minimum for perfect combustion. The smoke problem is then taken up with reference to gas analyses and curves plotted from the data adduced. Means for reducing smoke, without increasing the excess-air input to the boiler and thereby decreasing the efficiency of combustion, are considered with reference to some typical examples from modern practice. This excellent and exhaustive paper concludes with a minute discussion of the distribution of heat expenses.

In discussing this paper, J. W. Graves, of Pittsburg, stated that in his coal analyses, he considered the heat units, sulphur and ash, but the careful regulation of the sulphur has been productive of the best results.

Mr. Orr, in speaking of the difficulty in securing proper grades of coal, told of an experience with a broker with whom he had had a contract. This provided for a system of penalties and premiums, depending on the analysis of the coal supplied. The arrangement worked out very successfully, and has led to a very healthy competition among the coal companies on a basis of strict quality. Mr. Orr recommended the use of the recording CO_2 meter as a check on the firemen.

President Conkling stated that he had been carrying on some experiments in Scranton in the utilizing of the culm piles. His company owns three very large culm banks, and is testing various mixtures of culm with different grades of anthracite, bituminous washed coal, etc. He expects to be able to report on this experiment in the near future, and offers the data to the members of the association.

THURSDAY MORNING SESSION.

Thursday's session was devoted to commercial subjects, and the meeting was presided over by Duncan T. Campbell, of Scranton, chairman of the commercial day programme committee.

The first paper, entitled "Dollar Ideas," was presented by Earl E. Whitehorne, editor of *Selling Electricity,* New York.

Mr. Whitehorne's paper dealt with a discussion and examples of successful applications of revenue-producing ideas. He asserted that there are no formulas or rules for selling electric light, heat and power. It requires ability of many kinds—creative, executive and selling ability—all are essential, and it is well-nigh impossible for any one man to attain efficiency in all branches. He must gather in the good ideas wherever he can find them and hold them in readiness. The man who leads the sales force of any prospering central station is a man not necessarily older or longer in the business, but stronger than the average in resource, courage, optimism and ingenuity. He must be able to point the way and suggest the means. The more such "Dollar Ideas," original and borrowed, that man has at hand, the greater is his ability to inspire his men with constantly refreshened points of view. A number of cases were cited wherein central stations made use of "Dollar Ideas" in popularizing electricity to the material benefit of their resources.

This was followed by a paper by Van Dusen Rickert, of Pottsville, on the subject of "Methods of Securing New Business," a paper by R. A. Granger, of Chester, on "Commercial Effects of Tungsten Lamps," and a paper by D. T. Campbell, entitled "Advertising, Direct and Indirect."

Methods of securing new business, asserted Mr. Rickert, are mixed with questions of rates, of competition from gas, gasoline and acetylene, and at times of department relations. His paper deals quite fully with methods of securing new business for the departments of business lighting, small-residence lighting, sign, window and decorative lighting. Mr. Rickert urges that central stations keep in touch with the electrical publications which devote space to the sale of electricity, that they call upon the manufacturers for the information which they ever have been ready to give, and that from these various sources they select those methods which will stand the test of increased receipts which justify the expense of putting any plan into effect.

Mr. Granger's paper points out that the public is taking an increasing interest in matters of artificial lighting and the cost of obtaining lights. He regards this as an omen of good business for the central-station companies, particularly where the tungsten lamp is being introduced. Of twenty-nine central stations in Pennsylvania that replied in regard to the subject of this paper ninety-five per cent handle tungsten lamps. Their use is encouraged to displace gas lighting and for satisfying disgruntled customers. The tendency is to increase the standard of illumination without materially reducing the wattage except in cases of dissatisfied consumers and occasional large installations. The most popular sizes of tungsten lamps were found to be in the following order: Forty watt, sixty watt, one hundred watt, twenty-five watt. Regarding renewals, eighty-nine per cent of these companies find this matter to be quite satisfactory, and even where the cost of renewals is higher than the cost of replacing gas mantles the consumers generally have no complaint. In a given number of cases where tungsten lamps have been introduced sixty per cent of such installations have shown an increase in revenue, while forty per cent have shown a decrease. The majority of central stations in Pennsylvania find that new business has increased considerably. One year ago many managers were rather skeptical regarding tungsten lamps and only handled them on a small scale; but today everyone realizes their value to the electric-lighting industry. The manufacturers have made good their promise and the lamp today exceeds in useful life the claims that are made for it.

An extended abstract of Mr. Campbell's paper will be given in the section devoted to "Electrical Advertising and Selling," in an early issue.

These four papers were discussed jointly. The discussion was earnest and spirited, and embraced the various phases of the central-station selling problem.

E. F. McCabe, of Lewistown, asked for information as to the policy of member companies toward making long extensions for churches, citing an instance where he was asked to connect a small Lutheran church, 800 feet from his lines. The general opinion seemed to be in favor of connecting all churches, if possible, in consideration of the favorable impression which it makes on the church members.

Mr. Granger, of Chester, told of an arrangement he makes in such cases, whereby the customer pays half the cost of the line extension and is rebated as new customers are secured along the line.

E. B. Greene, of Altoona, gave an interesting account of an electrical installation on a farm situated six miles from his station, which brings in a revenue of about $200 a month, there being a full equipment of motor-driven churns, saws, etc.

Mr. Barton, of Philadelphia, in speaking of the tungsten lamp, warned the members against letting enthusiasm run away with better judgment, as the market for carbon lamps for use in closets and out-of-the-way places will continue for many years.

Mr. McCabe said that his attitude toward the tungsten lamp at present was very much that of the foreman of his electric department. He overheard him remark to the foreman of the gas department, that "if these here tungstens didn't cost so much and didn't break so easy and had a longer life, they would be the h—l of a good thing!"

R. A. McGregor, of Easton, cited an experience in a western city, where the gas company was supreme. When the tungsten lamp was placed on the market, he succeeded in installing seventy-five four-light tungsten clusters inside of three weeks, with a very marked effect on public opinion.

W. C. Anderson, of Plymouth, then read an interesting paper on the subject of "Co-operation with Contractors."

From the principle that several forces acting in the same direction will produce greater and more rapid progress along a given line it follows that co-operation between contractors and the central station will develop further and better the resultant of increased load and the wider use of electricity in any community. The development of this resultant being the natural common aim of central station and contractor alike, it brings up the consideration of the component forces and how best to apply them. One great difficulty to contend with is the reluctance of the consuming public to pay proper and legitimate prices to a corporation for work that it undertakes for them. The right to a fair profit will be accorded to an individual contractor, while not only is it denied to the corporation seeking to increase its business by entering the same field, but the proper conception of the amount of free work a company should do in return for the privilege of entering a new name in its consumers' ledger is a thing to marvel at. By leaving this work to a local contractor, this difficulty is overcome and the company also avoids the criticism, always ready to be hurled at the corporation, of crushing trade and creating a monopoly outside of its legitimate field. The contractor in many cases probably lived in the community before the present management of the company, and in return for the assistance he can be given in building up and extending a profitable business for himself, he can bring to the company the good-will and friendliness of the people who have confidence in him as an individual. A certain portion of the public will, by learning his opinion of the company and the treatment accorded him, come to a knowledge of the fairness and correctness of its methods and become willing to enter into relations with it. Co-operation which can be obtained between company and contractor depends to a large extent on the type of contractors doing business in any particular town, but it can hardly be denied that co-operation is not only desirable but necessary for the best interest of all concerned.

The discussion of this paper was opened by M. J. Fogarty, of Erie, who stated that his company had been forced to do contracting and carry supplies. It sells annually about $20,000 worth of supplies, $30,000 worth of fixtures and secures as revenue from wiring from $3,000 to $5,000. Customers are required to pay for a part of the cost of extensions on a yearly percentage basis. He said that he had made some interesting experiments to determine the practical life of the tungsten lamp and had a sixty-watt lamp which had burned over 3,500 hours. A general discussion ensued, in which a large number of the members participated.

Mr. Hoffman, of Philadelphia, described a very effective system in vogue in his city. The Philadelphia Electric Company has a standing offer of twenty-five cents per socket which is paid to any builder who secures the installation of electric wiring in any building he may erect. This arrangement has been in effect since 1896, and in one section 196 houses have been built with a cost of about $3,500 for extensions, etc. The first year's revenue from 149 of these houses was somewhere in the neighborhood of $4,250, the other forty-seven houses being unoccupied. About 4,900 sixteen-candle-power lamp equivalents were installed, the bonus to the contractors amounting to over $800. Mr. Hoffman does not believe in the company doing any repairing, citing an instance where a customer objected to paying for a new switch, though the old one had been in service some eighteen years. It happened that Mr. Hoffman lived in the neighborhood and was able to call this customer's attention to the fact that she had had her roof repaired on four different occasions, and the comparison was effective.

The session closed with the reading of a paper on "Power," by E. T. Penrose, of Tyrone.

This paper comprises an introduction (including definitions of the terms power, load factor, diversity factor, and power factor), and a series of short papers by the assistant editors, as follows: "Value of Off-Peak Business," by J. W. Reeves, Johnstown, Pa.; "The Influence of Off-Peak Business on the Cost of Manufacture at the Station," by T. E. Spence, Plymouth, Pa.; "How to Obtain Power Business," by R. A. MacGregor, Easton, Pa.; "High Load-Factor Business as a Money Getter for the Central Station," by J. B. Kilmore, Scranton, Pa. The objects sought are: (1) To prove that the small central station needs a day circuit, if in a manufacturing town. (2) To prove that the central station of whatever size must have a day load for its success, and that the day-load business must not be lost even though the rate made is less than the average cost. (3) How to obtain the business.

In connection with this paper Mr. Penrose submitted a number of selected data sheets, from figures which he had secured from various parts of the country, covering specific installations. These figures were worked out through successive stages to show the consumption per unit of product. He made a strong appeal for co-operation in the circulation of such data.

E. F. McCabe, of Lewistown, decried the tendency of central-station men to conceal exact power rates. He urged all members to join hands in the movement and show liberality in the interchange of real facts and figures.

THURSDAY EVENING SESSION.

Thursday evening was devoted to a demonstration and lecture by Prof. E. E. F. Creighton, of Schenectady, N. Y., on the subject of "Lightning and Lightning Phenomena." There was a large attendance of members, guests and ladies, and the experiments were exceedingly interesting. After the lecture, a number of the central-station men gathered in front, and there was a profitable discussion of the lightning arrester.

FRIDAY MORNING SESSION.

The Friday session was scheduled to open with an address by T. C. Martin. Mr. Martin was unable to be present, and his address was read by the secretary.

E. B. Greene, of Altoona, read a paper on the "Commercial Value of Constant and Efficient Service."

The author estimated the cost of interruptions of service to be two cents per minute for each inhabitant in the company's territory. An excellent advertisement is afforded by prompt and efficient re-establishment of service interrupted by fire or other causes. Practically constant voltage can be obtained by means of a Tirrill regulator, and a check on boiler rooms by the Venturi meter. Service means more than connecting up a customer's place to the company's line; it means also the thorough satisfaction of the customer by the convenience and reliability of each detail of the electric service. Instruction to prospective users on how to obtain the best results from the electric service is extremely desirable. Complaints should receive every attention and an attempt made to put one's self in the customer's place in dealing with them. Attention should be paid to the training of an efficient organization and the apprenticeship system should be carefully fostered, as thereby many of the best managers and executives are made. In conclusion, a special effort is essential to obtain a perfect harmony and co-operation among the members of the working organization, as only thus can ideal conditions be obtained.

V. D. Rickert, of Pottsville, took exception to Mr. Greene's statement, that the cost of a lapse of service could be computed at two cents per minute per inhabitant. Mr. Greene explained that this was based on the number of customers affected.

There was a general discussion in which Messrs. Granger, McCabe and Hoffman took prominent part and cited instances where a lapse of service meant actual damage and expense to consumers.

This was followed by a paper on "New Methods and Specifications for Street Lighting," by J. H. Perkins, of Wilkes-Barre. An extended abstract of this paper will be given in the department "Electric Lighting and Illuminating Engineering" in a forthcoming issue.

In discussing this paper, Mr. Davis, of Williamsport, urged the adoption of the foot-candle as the unit of illumination in street lighting, as it enables the company to take advantage of new apparatus which may give better results in illumination at a lower initial candlepower.

Mr. Scroll, of Philadelphia, endorsed this recommendation. He said that he had given considerable attention to this matter, and stated as his opinion that it was dangerous to make official tests of lamps in place, inasmuch as the figures will be materially affected by pavement, color of adjacent buildings, atmospheric conditions, season, etc. Marked interest was shown in the subject of street lighting contracts, and a recommendation was made that the association secure further data on the subject.

At this point of the programme the meeting went into executive session to receive the report of the nominating committee. The nominating committee moved the re-election of the present officers. President Conklin, however, after expressing his appreciation of the honor, urged the association against the establishing of such a precedent and asked that the matter be reconsidered, as he felt that it would serve the best interest of the association if the term of the chief executive were limited to one year by custom, if not by law. The committee took the matter under further consideration and the following officers were subsequently nominated and elected:

E. L. Smith, of Towanda, president.

R. A. Granger, of Chester, vice-president.

Van Dusen Rickert, of Pottsville, secretary.

Members of the executive committee: R. S. Orr, of Pittsburg; E. F. McCabe, of Lewistown; J. H. Perkins, of Wilkes-Barre, and M. J. Fogarty, of Erie.

The remainder of the session was given up to further consideration of commercial subjects, and a motion was passed instructing the executive committee to consider ways and means to secure adequate legislation for protecting central stations against current theft. W. C. Anderson, of Plymouth, recited a case where the guilt of the accused was unquestioned, but in spite of that fact conviction could not be secured owing to the faulty construction of the law, inasmuch as it could not be proved that the consumer was personally responsible for the theft. He urged that all effort should be made to effect such legislation that the customer might be held responsible for conditions on the premises. Other members had had similar experiences and expressed hope that the association by concerted action might be able to relieve the situation.

In considering Pertinent Question 3—"What is the proper location for a customer's meter?"—F. M. Noecker, of Renovo, gave some interesting information with photographs showing the practice in his territory. All new houses are being built with a meter cabinet, opening on the side or rear porch, and in a great many instances he has been able to change the location of the meter in old houses. A customer finds it more satisfactory, because the meter reader does not have to enter the building and is able to read 300 meters a day, against eighty where it was necessary to obtain admission to the premises. The men start out at 7 o'clock in the morning, which is, of course, impossible with inside meters. Cabinets are built flush with the walls and protected against changes in temperature. The expense to the consumer in cases of new houses is no greater, and the advantages are such that in many instances present consumers have requested that the change be made.

In discussing Pertinent Question 10—"Is it not advisable for the association to maintain a list of solicitors who have specialized in different departments of the work?"—President Conklin stated that he had received several calls from member companies for special solicitors and this should be seriously considered. "The function of the association," he said, "is to give real and tangible assistance to the member companies, and it should be possible to make some arrangements for the securing of such specialists."

The introduction of the list of pertinent questions at this convention is an indication of the activity of the individual members, as the questions had been submitted by various members of the association for consideration at the convention. The discussions at all sessions were earnest and pertinent, and brought out a great deal of interesting information.

Eagles Mere itself proved an ideal spot for a real business convention. The extreme beauty of the lake and mountain scenery came as a distinct surprise to all, and the selection was a happy one in that there was a gratifying absence of all noise and confusion.

Among the social features were a reception and dance on Tuesday evening, a drive for the ladies on Wednesday morning, and a baseball game between the central-station and supply men on Wednesday afternoon. The baseball game was a great success from the entertainment standpoint, the central-station men being the victors with a score of 11 to 4. In the evening boating and dancing were enjoyed. Thursday morning there were cards for the ladies, Thursday afternoon a scenic railway trip to Lake Mokoma, and in the evening a very successful corn roast immediately following the lecture by Professor Creighton. Friday morning was spent by the ladies in driving and in the afternoon there were aquatic sports in which the various members participated.

The manufacturers were well represented and there were especially interesting exhibits of recent electrical products of the General Electric Company and the Westinghouse Electric and Manufacturing Company. Special lighting equipment

was installed by the lamp manufacturers, prominent among which were the regenerative arc lamp manufactured by the Adams-Bagnall Company and the new tungsten "arc" lamp made by the Philadelphia Electrical and Manufacturing Company. A representative of the Holophane Company gave demonstrations of combined Holophane-tungsten efficiency.

American Manufactures to Europe.

Exports of American manufactures to Europe rose from a value of $111,500,000 in 1905 to $367,500,000 in 1908, a gain of $252,000,000, or a little over 230 per cent. Other exports to Europe increased from $509,000,000, or seventy-seven per cent. These figures of exported manufactures include manufactures ready for consumption (or finished manufactures) and manufactures for further use in manufacturing. In finished manufactures the rise was from $62,500,000 to $173,000,000, a gain of nearly 200 per cent. The export growth in the group of manufactures for further use in manufacturing was even greater, the total value of articles in this group sent to all Europe in 1895 having been in round terms $19,000,000, and in 1908, $194,000,000, having thus practically quadrupled in the thirteen years, says the Bureau of Statistics.

The 1908 fiscal year exports of manufactures to Germany included principally:

Copper	$19,750,000
Illuminating oil	7,846,803
Rosin	3,676,803
Lubricating oil	2,891,511
Furs and fur skins	2,030,591
Metal working machinery	1,935,468
Spirits of turpentine	1,874,547
Boards, deals and planks	1,749,472
Mowers and reapers	1,651,483
Sewing machines	1,170,598
Upper leather for shoes	1,164,567
Typewriters	1,023,440

Other manufacturers sent to Germany in 1908 included cash registers, builders' hardware, tools, artificial teeth, varnish, electrical machinery, laundry machinery, boots and shoes (leather and rubber), corn, oil, bicycles, plows and cultivators, brass manufactures, automobiles, watches, cotton knit goods, twine, cutlery, fire-arms, steam engines, wood-working machinery, printing presses, pipes and fittings, stoves and ranges, pianos, organs, automatic piano-players, nickel oxide, paraffine, staves, sawed timber, hewn timber, vulcanized fibers, and a host of other manufactured articles of lesser importance.

Railway Legislation in Connecticut.

The session of the Connecticut General Assembly that recently adjourned made a large addition to the volume of railroad legislation, both general and special.

Among the new street-railway laws is an act authorizing the Railroad Commissioners to direct trolley cars to be equipped with air brakes and to direct suburban cars to be supplied with stools for motormen. Another measure specifies that orders concerning the relocating and removal of tracks and changes in grade, except on the application of a railroad company, shall be made only for the purpose of public improvement, and that when the petition is made by the company the cost of the changes shall be borne by the corporation. Corporations, partnershhips and individuals operating an express business on electric railways are required to make an annual report to the State Tax Commissioner and to pay a tax of two per cent on their gross revenues.

Among the special trolley laws are resolutions incorporating the Tolland County Street Railway Company, the Tolland Street Railway Company, and the West Peak Railway Company, and authorizing the construction of an industrial railway in Bridgeport.

An International Aerial Exhibition.

From *Engineering*, of London, we learn that an International Exhibition of Aerial Navigation is to be held at the Grand Palais, Paris, from September 25 to October 17, under the patronage of the President of the Republic and all the French Ministers of State. Among the honorary presidents we find the name of Mr. d'Estournelles de Constant. The executive committee contains the names of several well-known aeroplane builders and aviators. The exhibits are to include balloons, dirigibles and accessories, flying machines, motors and accessories, scientific instruments, raw materials and manufactured articles for aviation, devices for packing and transporting flying machines, etc. In calling the attention of its readers to this exhibition, *L'Industrie Electrique* adds that electricians cannot remain indifferent to the progress made by aeroplanes, to which they have greatly contributed, for had it not been for electric ignition, the motor-car industry would never have been brought to its present state of perfection, and aviation would probably not have been possible.

Canada's Exports of Electricity and Natural Gas.

The annual report of the gas and electricity inspection branch of the Inland Revenue Department at Ottawa, Canada, shows that during the last fiscal year the total amount of electricity exported by the four companies operating under the electricity and fluid exportation act was 359,283,286 kilowatt-hours, as compared with 135,075,680 kilowatt-hours generated for home consumption. The Canadian Niagara Power Company exported 221,927,240 units, and generated for home consumption 5,405,760 units. The Electrical Development Company exported 4,680,500 units, and generated for home consumption 85,515,700 units. The Ontario Power Company exported 131,833,782 units, and the home consumption was 44,150,580 units. The Maine & New Brunswick Power Company generated for export 841,764 units, and the home consumption was 3,940 units. Only one company was licensed to export natural gas during the year. The Provincial Natural Gas and Fuel Company, of Ontario, exported 387,019,000 cubic feet, and its home consumption was 462,707,000 cubic feet. After this no licenses will be issued allowing exportation of natural gas.

Of 45,693 gas meters presented to the department for verification, 8,190 were verified as correct, 11,482 were found fast, and 24,576 slow, but the error in each case came within the variation tolerated by law. The total number of gas meters rejected was 437.

Bronx Gas and Electric Company.

The Bronx Gas and Electric Company has applied to the New York Public Service Commission for approval to an issue of $1,500,000 of bonds, the bonds to be secured by a first mortgage on the company's property. There is, at the present time, a mortgage outstanding of $500,000 to secure that amount of outstanding bonds and three small mortgages upon real estate belonging to the company, aggregating $30,100.

The outstanding stock of the company has a par value of $486,500, upon which the company has been paying five per cent dividends during the years 1904, 1906, 1907 and 1908.

The company states in its application that, of the one-and-a-half million dollars of bonds for which it asks approval, it is its plan to issue at the present time only $740,000 worth, chiefly to retire outstanding obligations, including the prior bonds.

Electric Supply System of a Scottish Coal-Field.

BY A. H. BRIDGE.

Mining engineers and officials in Scotland have lately been interested in inspecting the new electrical system that has been completed for supplying energy to five pits of the Lochgelly Iron and Coal Company, Limited. The entire coal-field comprises ten pits extending over an area of some sixteen square miles, and from these an aggregate of one-and-one-quarter million tons of coal are raised annually. Electricity has been employed on a more limited scale for some years, a number of isolated continuous plants generating low and medium-pressure current, serving for lighting and power requirements. The work detailed in the following notes is a modernizing and extension scheme which has been carried out under the advice, and to the designs, of James E. Sayers and Caldwell, consulting engineers of Glasgow, who, on various grounds, recommended high-pressure generation at a convenient point with distribution to the several consuming points. The writer desires to express his indebtedness to the consulting engineers for the accompanying photographs of the installation, and to the paper recently published by John Paul before the Institution of Mining Engineers, for the drawings, as well as for the main information forming the basis of this article.

The plan shows the position of the generating station, and the various transformer stations at the electrified pits which are known as Nellie, Mary, Newton, Jenny Gray and Melgund. High-pressure three-phase plant sufficient for these five pits has been installed in the first instance, though the general design provides for, or facilitates, the ultimate inclusion of the other five. Investigation showed that an estimated load of 613 brake-horsepower between the hours of 6 p. m. and 6 a. m. had to be provided for, and of 761 brake-horsepower during the remainder of the twenty-four hours, so two 450-kilowatt generators were first proceeded with, leaving place for a third set of similar size and a 1,000-kilowatt exhaust or mixed-pressure turbo-generator; and the object of the engineers was to avoid modification of the present plant when these additions are proceeded with.

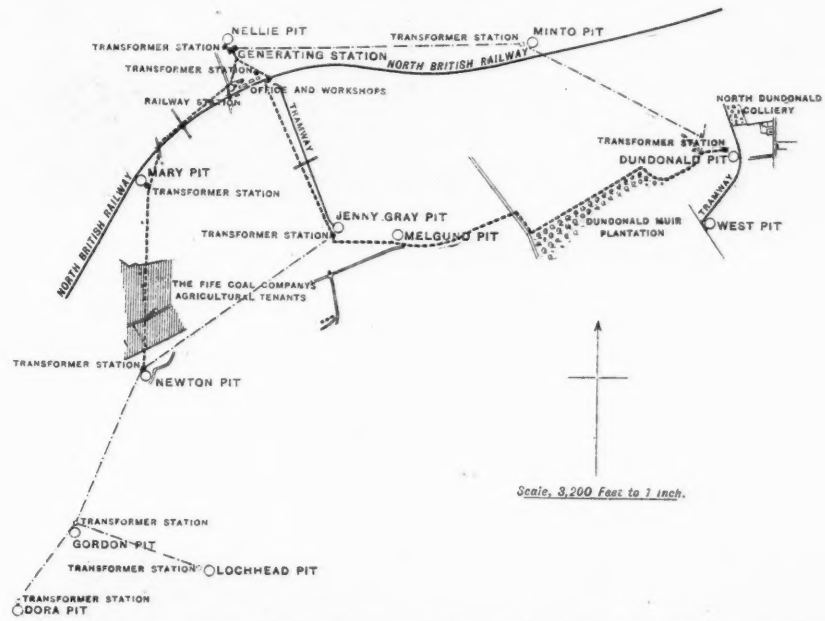


FIG. 1.—PLAN SHOWING POSITION OF THE COLLIERIES SERVED BY THE GENERATING STATION.

The heavy dotted line indicates the two lines now in operation. The dotted line from Jenny Gray to Dundonald Colliery is the extension not yet at work. The chain-dotted lines are probable future extensions.

The generating station is near Nellie, at which pit a second winding engine will be required later, when the question of utilizing the exhaust steam from the winding and other engines there—now deferred—will come further under attention. It should be mentioned, however, that it is with a view to the ultimate adoption of this principle that the power house has been located at the Nellie pit. It is understood that reciprocating engines were adopted because makers quoted prices, and guaranteed steam consumptions, which were in favor of this type for sets up to 1,000 kilowatts capacity, but the fact that on the mines Belliss steam engines had previously proved satisfactory also told in their favor. Evaporative condensers are in vogue, as these only require twenty-five per cent of the circulating water required for a surface-condensing plant. The vacuum obtained is not more than twenty-five or twenty-six inches, but a hot feed is obtained. When the proposed turbo-generator set is put down, either surface or ejector condenser plant will be installed in connection with it. The boilers, which are of the water-tube variety, are 200 feet away from the nearest generating unit, owing, Mr. Paul says, to the necessity of selecting a site convenient for the future collection of steam for the proposed exhaust turbo-generator, and the necessity for placing the new boilers in line with the Lancashire boilers already in use.

The change over from the old direct-current drives to the new three-phase supply was commenced early in this year, and has since been proceeding gradually, taking place almost entirely on Sundays. In the plan it will be observed that the Dundonald pit is shown in addition to the others named. This colliery has been only recently acquired, and it involved two miles' extension of the transmission line from the Jenny Gray transformer house.

Coming now to the particulars of the plant, the power house is lined with glazed bricks and is served by a ten-ton crane. There are four Babcock and Wilcox boilers in two batteries, each boiler having 2,531 square feet of heating surface, and being fitted with a new type chain-grate mechanical stoker, and integral type superheaters. The two Belliss and Morcom self-lubricating, three-crank, triple-expansion engines are direct-coupled to two Bruce Peebles, three-phase, fifty-period alternators having exciters on the same shaft. Each set is to give a continuous output of 420 kilowatts on a 0.8

power-factor at 3,000 to 3,300 volts, at 375 revolutions per minute. The condenser consists of 336 corrugated pipes in fourteen coils of twenty-four pipes each.

The high-tension switchgear consists of four generator and six feeder panels, two of the former and four of the latter being at present fully completed. The feeder panels are supplying the transformer for the Nellie pit, and for the power-house motors, the overhead line supplying the Mary and Newton pits and the overhead line supplying the workshops, Jenny Gray, and the Dundonald colliery. Two further panels control the low-tension three-phase current from the power-house transformer, one controlling a fifty-kilowatt motor-generator for giving 200-volt continuous current for the lighting of the power house, Nellie pit-head, and the offices and shops; the other controls the air pump, condenser and centrifugal-pump motors. There are no "live" metal parts or connections on the front of the three-phase panels. All but the measuring and indicating instruments and the oil-switch handles are placed in screened cubicles in a switchboard recess, which is guarded with Boswick gates with locking arrangements. The synchronizing busbar voltmeter and earth-detecting panels are on the sides of the brick piers within which the main panels are placed.

On each of the equipped generator panels is mounted (1) a three-pole oil switch having automatic reverse power trip-gear, arranged to disconnect a faulty machine from the busbars; (2) an indicating wattmeter; (3) an ammeter; and (4) the necessary plug connections for the operation of synchronizing.

In front of each of these panels is an exciter pillar, comprising a rheostat handle for varying the exciting current to the generators, an ammeter, a voltmeter, and an exciter-field switch.

On each of the feeder panels is mounted (1) a three-pole oil switch having automatic overload and out-of-balance trip-gear, arranged to disconnect a feeder in the event of a predetermined overload, or in the event of any line or lines of the circuit becoming earthed; (2) an indicating wattmeter; (3) an ammeter; and (4) a kilowatt-hour or integrating wattmeter, to measure the units of electrical energy supplied to the individual circuits.

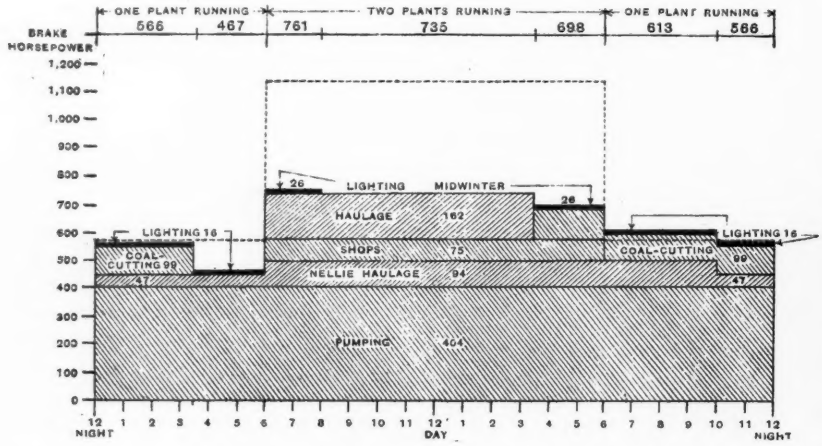


FIG. 2.—INDICATING INCIDENCE OF LOAD OVER 24 HOURS FOR ESTIMATED IMMEDIATE REQUIREMENTS OF NELLIE, MARY, JENNY GRAY AND NEWTON PITS, AND THE WORKSHOPS.

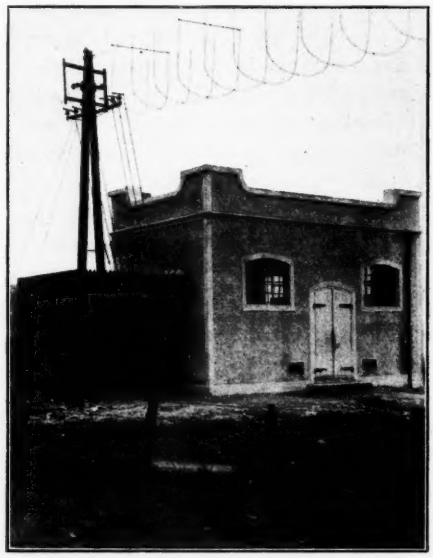


FIG. 3.—VIEW OF A LOCHGELLY TRANSFORMER HOUSE, SHOWING CONNECTIONS TO TRANSMISSION LINE.

On each of the low-tension three-phase panels is mounted (1) a three-pole oil switch, as on the high tension feeder panels; (2) an ammeter; and (3) one volt meter common to both panels.

There are no fuses on any of the three-phase panels. On the 200-volt continuous-current lighting panel is mounted (1) a main switch and three circuit knife switches; (2) a pair of main and three pairs of circuit fuses; (3) a voltmeter; (4) three ammeters; and (5) a field rheostat for voltage control.

The whole supporting structure is of iron, the sides and tops of the cubicles

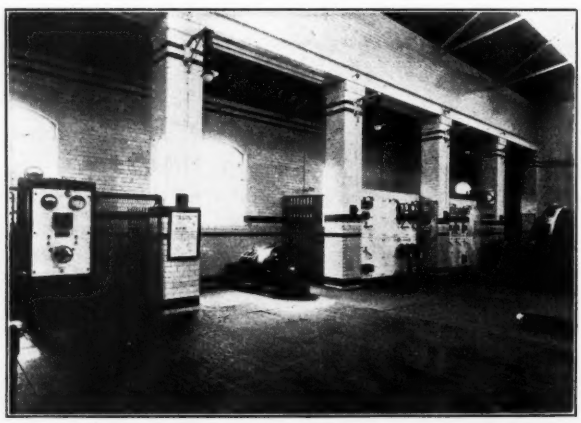


FIG. 4.—VIEW OF SWITCHBOARDS AND TRANSFORMERS FOR NELLIE PIT AND POWER-HOUSE MOTORS.

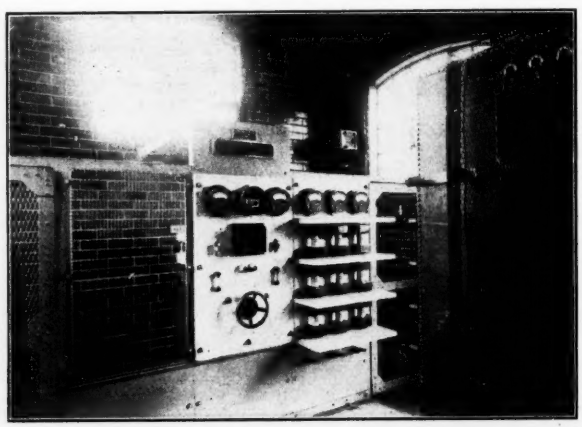


FIG. 5.—LOW-TENSION SIDE OF TRANSFORMER HOUSE.

are of slate, and the panels themselves are of marble.

The switchboard is not entirely dependent upon the motor-generator for lighting supply, and is provided, as a safeguard, with lamps fed by a small static transformer.

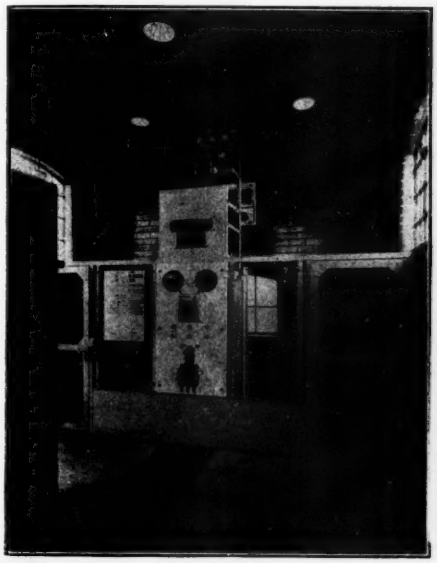


FIG. 6.—HIGH-TENSION SIDE OF TRANSFORMER STATION.

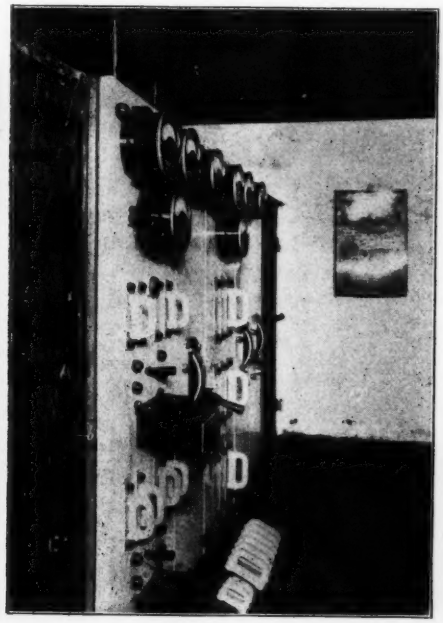


FIG. 7.—ONE OF THE IN-BYE SWITCHBOARDS.

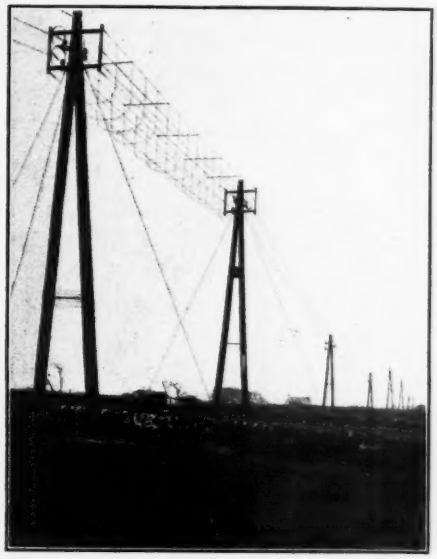


FIG. 8.—VIEW OF OVERHEAD LINE WORK, SHOWING CRADLING OVER ROADWAY.

The high-tension distributing system consists of overhead lines from the power station to the Mary and Newton pits to the southwest, to the workshops and the Jenny Gray pits to the southeast, and several lengths of lead-covered and armored paper cables under the North British Railway track and from the power house to the adjacent terminal pole. All the overhead line wires and apparatus are protected against lightning and excessive pressures by spark gaps, and over public roadways and at certain points near the pits adequate cradling is observed.

Each transformer house has two 200-kilowatt oil-cooled transformers (0.8 power-factor) and the requisite switchgear. The transformers are wound to transform three-phase current from 3,000, 3,150 and 3,300 volts to 525 volts. Ferranti type switchgear is used, comprising a high and a low-tension panel for each transformer, with automatic oil switches, indicating instruments, and an integrating wattmeter. Faulty transformers are automatically cut out. On the high-tension side of the board, space is left for a high-tension feeder panel should it be required to take high-tension circuits down the mine shafts. On the low-tension side there are three circuits, each of 200 kilowatts capacity, for transmission of 525-volt current for shaft cable or other purposes. The shaft and in-bye cables are of three-core bitumen, insulated and filled, and double-armored with galvanized steel wires. Cleats of special design support them at intervals of forty to fifty feet, and they are suspended in-bye by hempen slings. Substantial armor clamping rings assure electrical continuity of the armoring throughout each network, and the whole is effectively earthed. The in-bye switchboards were designed for underground conditions, and are of substantial construction. Each board has an auto-transformer for the supply of current to fifty lamps. The sub-circuit fuse boards are of heavy mining type, with porcelain barrel fuses, and all have connections on the front of the slate panels; they are enclosed in cast-iron cases with armor anchor rings, and the lids of braced iron plate are hinged and secured by wing-nuts.

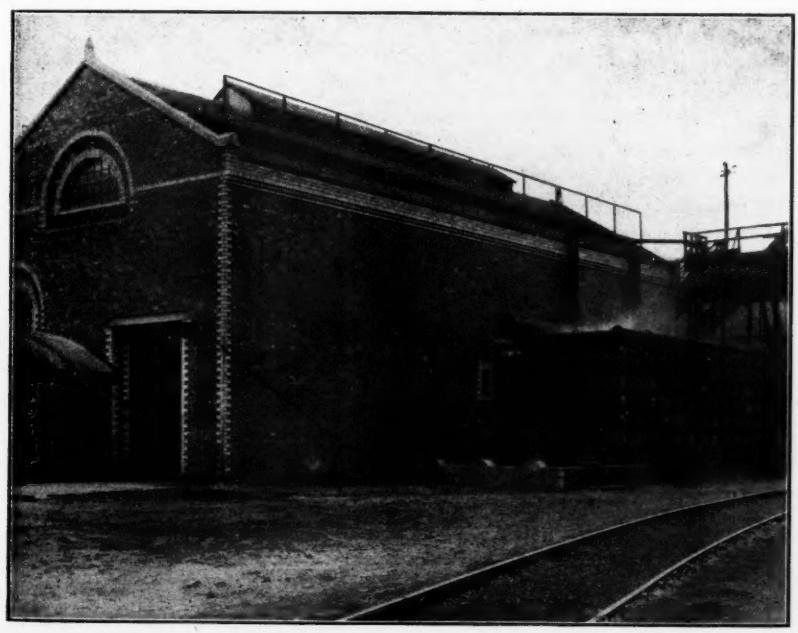


FIG. 9.—VIEW OF LOCHGELLY POWER HOUSE AND EVAPORATIVE CONDENSER.

The uses to which motors are put in the pits comprise haulage, pumping and fan driving, also coal-cutter driving.

It is reported on good authority that telephone and telegraph extensions projected in the Transvaal will total up to no less than $1,250,000.

New York's Illuminations.

The City Hall, the Washington Arch, Brooklyn Borough Hall and the Brooklyn Bridge were electrically lighted by the New York Edison Company on one or two occasions last week with many thousands of incandescent bulbs, to show how they will appear during the eight nights of the Hudson-Fulton celebration allotted to this section. The illuminations last week were for the benefit of the illuminations committee of the Hudson-Fulton Celebration Commission. The system of lighting shown is similar to that to be used during the celebration.

The City Hall was first lighted up. All its outlines were brought out by lines of electric lights, stretching across the front and sides of the building, up and down the pillars and the dome was also lined. There were 3,500 eight-candlepower incandescent lamps, strung twelve inches apart, making a total of 28,000 candlepower.

Washington Arch, on Fifth Avenue and Washington Square, north, close to the end of the route of the three land parades of the celebration, was illuminated by 1,500 lamps, of the same power and spaced as at the City Hall. Every detail of the arch was brought out distinctly by the great flood of light. There was a total candlepower of 12,000 and the horsepower required was approximately fifty.

Brooklyn Borough Hall required more for its illumination than the City Hall in Manhattan. It took 3,600 eight-candlepower lamps, or a total candlepower of 28,000, to bring its outline into bright relief, and a horsepower of about 120.

Brooklyn Bridge produced the finest spectacle of all. Cables, towers and roadway were shown in bright lines of electric light, hanging like a fairy span above the river. It gave a promise of the grand scenic effect when all four of the bridges will be illuminated when the celebration begins this evening. For the Brooklyn Bridge alone 13,000 lamps, strung in eighteen inches apart, with a total candlepower of 104,000, using approximately 433 horsepower, were necessary. On all of the four bridges there will be about 49,000 incandescent lamps.

It is certain that the illuminations, both in originality and scope, will far surpass anything before seen. A huge, blazing national advertisement to all the nations of the earth, the spectacle afforded will be a fitting tribute to the pioneers honored thereby.

Standard Oil in Columbia Gas and Electric.

Conferences have been held in Cleveland, O., between representatives of the Standard Oil Company and officials of the Columbia Gas and Electric Company, with a view of organizing a $20,000,000 concern to merge gas and lighting companies in Ohio. A. C. Bedford and J. W. R. Crawford, representing 26 Broadway, and Archibald S. White and F. B. Enslow, president and vice-president, respectively, of the Columbia Gas and Electric Company, are handling the deal, which, it is expected, will be closed so that the consolidation may become effective by October 1.

It is planned to merge the Cleveland city gas companies, owned by the Columbia Gas and Electric, and the East Ohio Gas Company, of the Standard Oil Company. The two Columbia companies are the Cleveland Gas Light and Coke Company and the People's Gas Light Company. These properties will be acquired by the new corporation, which will probably be known as the Ohio Gas Company.

The stocks owned by each in the present individual companies will be exchanged for stocks and bonds in the new company, and in this way the control of the big new company will rest in the Columbia company and the Standard Oil interests.

The Cleveland Gas Light and Coke Company, which serves the territory east of the Cuyahoga River, was incorporated in 1846, and the People's Gas Light Company, operating west of the Cuyahoga River, was incorporated in 1868.

The former has 537 miles of mains with 42,000 meters installed and owns valuable real estate on which are situated its manufacturing plants, etc. The daily capacity is 5,000,000 cubic feet and the annual output about 1,500,000,000 cubic feet.

The People's Gas Light Company has 203 miles of pipe line with 14,000 meters installed and owns much real estate for its requirements and corporate uses.

Classified Telephone List.

The first issue of the New York Classified Telephone Directory, hitherto published under the name of the Alcolm Red Book, containing complete classified lists of New York business houses in the boroughs of Manhattan and the Bronx, subscribing to the New York Telephone Company service, is ready for distribution by the publisher, Reuben H. Donnelly, 227 Fulton Street.

Western Electric's Position.

The Western Electric Company has shown considerable and steady growth during the nine months of its fiscal year which have elapsed, and which will go to make the year 1908-9, ending November 30, loom large in comparison with the preceding fiscal year.

Returns for August show that the month ran sixty per cent ahead of August, 1908; also showing a gain of about five per cent over July. August, 1909, was ten per cent ahead of August, 1907, the year in which the Western Electric's sales reached $53,000,000, the second largest total in the history of the corporation. At the rate of the August increase the business for the current year would run in excess of $53,000,000.

The three quarters of the fiscal year which have elapsed indicate gross sales for the year of about $47,000,000. While this figure is far below the $69,000,000 total for 1906, and the $53,000,000 for 1907, it is eminently satisfactory, as compared with last year, representing, as it does, a gain of $14,000,000, or forty-two per cent, over the total gross sales in 1907-8 of approximately $33,000,000.

In the United States, outside of the Bell system, there are about sixteen thousand so-called independent telephone companies. Of the "outside" operating companies, 6,000, or thirty-seven-and-one-half per cent, are customers of the Western Electric Company, although the company has followed the policy of selling to outside companies not longer than two years. The company's business with the Bell companies is reported as showing a satisfactory rate of increase.

The year to date has also been marked by especially good sales in cable, electric machinery, and general electric-light supplies, and in these lines many records of other years have been broken.

American Institute of Electrical Engineers.

The next regular meeting of the American Institute of Electrical Engineers will be held in the auditorium of the Engineers Building, 33 West Thirty-ninth Street, New York, on Friday, October 8, 1909, at 8 p. m. John B. Taylor, of the railway and traction department of the General Electric Company, Schenectady, N. Y., will present a paper entitled "Telegraph and Telephone Systems as Affected by Alternating-Current Lines." The paper will be printed in the October Proceedings of the Institute.

MEETING OF THE CHICAGO ELECTRIC CLUB.

RESIGNATION OF PRESIDENT HOWLETT, UPON WHOM IS CONFERRED A LIFE MEMBERSHIP.

The regular midday meeting of the Chicago Electric Club was held in the grill room of the Chicago Automobile Association at 12:15 p. m., Wednesday, September 15. The principal address was delivered by Frederic A. Delano, president of the Wabash Railroad. Mr. Delano took for his topic, "A Plan for a New Union Passenger Railway Terminal for Chicago."

Mr. Delano first began talking about the terminal question in Chicago about five years ago. At that time he published a pamphlet analyzing the conditions, and about two years later he discussed the subject before the Chicago Real Estate Board. The paper which was delivered at that time had been reprinted, and this paper was distributed to the members of the Electric Club, so that Mr. Delano sketched briefly only the principal features of the problem.

For nearly ten years Mr. Delano was superintendent of the yards for the Burlington & Quincy Railroad at Chicago. It seemed to him that in the rapid growth of the railway systems and the interlacing of one railroad with another, a very much confused condition of affairs had come about. In studying this problem, one of the first things that was apparent was that of the twenty-six railroads terminating in Chicago, some of them representing lines with two or three entrances to the city, most of them entered the city from the south. Most all those that enter the city from the west come in along Sixteenth Street, so that with the exception of the Chicago, Milwaukee & St. Paul and the Chicago & Northwestern, every trunk line entering Chicago comes in from a point south of Sixteenth Street. This seemed to indicate that it would be possible to choose some main thoroughfare and line up the railroads and bring together a group of stations along one main street. This group of stations would accommodate all of the railroads, and by adopting more than one level, the transfer of both passenger and freight traffic would be greatly facilitated.

There are six main depots in Chicago now. Each of the roads interested in each of these groups of stations might spend $20,000,000, as the Northwestern is now doing, and might greatly improve its individual station. Yet, on the whole, the result would not be satisfactory to the city of Chicago and to travelers generally, because in scattering the stations about the city it is impossible to secure the advantage of any system of intramural transportation. At the present time every through ticket reading beyond the city of Chicago carries a fifty-cent coupon for the conveying of passengers and baggage from one depot to another. This involves a very heavy impost on the traffic. All passengers and baggage and less than carload freight has to be transferred through the city by team, and this involves a very uneconomical method of handling this business.

Mr. Delano said he would be glad to see the engineers of the city make a special study of the problem. The solution

C. A. S. HOWLETT.

which he offers is not the only one available, and he has made these suggestions as an engineer and a citizen and entirely without consideration of his official connection with any railway system.

In deciding upon the point for the massing or grouping of the series of stations, Mr. Delano has selected Twelfth Street because it so happens that it is the only thoroughfare between Harrison Street on the north and Eighteenth Street on the south, a distance of three-quarters of a mile, which goes from the lake front to the West Side. This street offers every facility for tapping the other main thoroughfares from every other section of the city. It is also apparent that the club and business life of the city is moving in this direction, and it is a fact that Eighteenth Street today is no further south with regard to the business center than Twelfth Street was five years ago.

It is quite possible, and only fair, to assume that the immense expenditure that the Northwestern road is now making will render unfeasible the co-operation of this road in establishing a station on Twelfth Street on the South Side. In this event it would be possible to establish two groups of stations, one on the South Side and one on the West Side. It would not be as convenient in all respects, but would still be far superior to the present conditions.

At the close of his address, Mr. Delano replied to several questions, speaking at some length with regard to the effect electrification of the main lines would have on his proposed plans for a union terminal. Mr. Delano said that there was nothing in the plan that could not be carried out more readily with electrification than with steam. It is recognized that with a multiple-level system there are difficulties of operation with steam locomotives which would be eliminated by the use of electricity. Any development of electricity would help rather than hinder this proposition.

In closing, Mr. Delano said that it is not a new thing to move a station back of where it once was. So far-sighted a man as Cornelius Vanderbilt, when he built the Grand Central Station in New York city, abandoned a site at Twenty-Sixth Street and Fifth Avenue, where the New Haven road had a station, and abandoned a site at Thirty-third Street and Seventh Avenue, where the New York Central had a station, and built his big terminal at Forty-second Street. At the time this station was built there were no office buildings in that part of the town.

Upon motion, Mr. Delano was given a hearty vote of thanks for his address.

Following Mr. Delano's address, C. A. S. Howlett, who has been president of the club since its inception, announced that, owing to his change of address to New York city, it had been necessary for him to place his resignation in the hands of the Board of Managers. Mr. Howlett then reviewed the past and present history of the organization, and in discussing the future laid before the club an admirable series of suggestions, looking to its development and increasing advantage.

The club is now in its second year. There is a comfortable balance in the bank, and the 375 members in good standing are representative of the most aggressive and enterprising men in the electrical business or profession. There are, however, a great many men in the electrical business in Chicago who are not now members. When these men join and

add their influence, the club will be appreciably benefited.

Among the important suggestions made by Mr. Howlett were the preservation of the addresses and discussions and the publication of a monthly or quarterly bulletin for distribution to the members; the preparation of an emblem; the co-operation of the club with other organizations in movements of a public nature; the establishment of correspondence with clubs in other cities, and arrangements for interchange of recognition on the part of traveling members. Mr. Howlett also suggested the development of plans for permanent quarters, the immediate enhancement of the work of the membership committee, the taking up by the club in a strong way of assistance to the city electrician in securing from the State Legislature increased appropriation for a better lighting of the city streets. The organization and development of a glee club, several plans for the work of the entertainment committee, and a general discussion of a plan for co-operation between the officers and the several committees was also presented.

Mr. Howlett announced his sincere regret at being compelled to resign from the office of president and extended his thanks and best wishes to the remaining officers and the Board of Managers and to his successor.

Upon motion, Mr. Howlett's address was referred to the Board of Managers for action.

W. S. Taussig, secretary of the club, took charge of the meeting and requested A. A. Gray, on behalf of the members, to express their regret at the retirement of Mr. Howlett from his active duties in the club and their appreciation of his services. Mr. Gray rehearsed very briefly the strong individual work which Mr. Howlett had rendered and extended to him the best wishes of the organization for his continued success. The meeting then adjourned.

At the meeting of the Board of Managers held on Friday, September 17, a resolution was passed tendering to Mr. Howlett a life membership in the club in recognition of his services. This action was heartily endorsed by the members at the meeting on September 22.

Favors the Electromobile.

In the great parks in London, Eng., one is permitted to run an electromobile at hours when the use of other forms of self-propelled vehicles is prohibited.

Rate of Helium Production from the Complete Series of Uranium Products.

In a letter to the editor in a recent issue of *Nature,* of London, the Hon. R. J. Strutt writes as follows:

"A knowledge of this constant (the rate of helium production from the complete series of uranium products) is essential to the estimation of the ages of minerals from their helium content. In a paper published in the proceedings of the Royal Society, July 28, 1908, I gave the ages of some minerals provisionally on the assumption that the rate was 9.13×10^{-8} cubic centimetres per gramme U_3O_8 per annum. This rate was calculated from Rutherford's indirect data. It has received much support from Sir J. Dewar's determination of the rate of production by radium with its immediate products. I am now in a position to confirm it further by an experiment on the rate of growth of helium in a solution of pitchblende; I speak of a solution, but it has been found impracticable to take up all the constituents by one solvent. Two solutions were necessary. The pitchblende solutions contained 115 grammes of U_3O_8, and yielded in sixty-one days a quantity of helium which was measured as 2×10^{-6} cubic centimetres in the capillary of a McLeod gauge. This gives the rate as 10.4×10^{-8} cubic centimetres per gramme U_3O_8 per annum. No stress can be laid on the close agreement with Rutherford's estimate in view of the very small gas volume measured. The experiment proves, however, that that estimate is of the right order of magnitude. Larger scale experiments are in progress, and these, in conjunction with similar experiments on thorianite, will, it is hoped, enable data on the quantity of helium in minerals to be translated into estimates of time with full confidence."

Electric Lights to Flash Fire Alarm.

Fire Chief Hamilton, of Lawrence, Mass., has installed a unique fire-alarm box and signal system on Essex Street in that city, according to a recent issue of the *Municipal Journal and Engineer.* New boxes are installed, upon each of which is a red electric light. These lights will flash at each stroke of the alarm, so that it will be possible to learn the box by just watching the light. On the south side of Essex Street, near the transfer station, will be a large gong on a box to be located there. This gong will ring at every alarm, and can be heard for a distance of 100 yards.

Electric Furnace Development in Mexico.

The Mexican Steel and Chemical Company has been organized in the City of Mexico, where a plant for the manufacture of calcium carbide using a continuous type of furnace is already under construction. The company also proposes to utilize the Héroult type of electric furnace for steel refining. Tool and drill steel, shoes and dies, forgings and castings and also light steel rails will be manufactured.

The current will be purchased from the Mexican Light and Power Company, and will be taken from the mains at a pressure of 20,000 volts. Both furnaces will be operated on the single-phase system. The carbide furnace will be designed and constructed by Charles Bingham, of London, England, and the steel furnace by Robert Turnbull, of St. Catharines, Ont., Can., acting for Doctor Héroult. J. T. Morrow, of New York city, is the managing director of the company.

Dry Storage Batteries.

From Christiania, says *The Electrical Engineer,* of London, come vague rumors of what may prove to be a triumphant forward movement in electrotechnics. It is said that a local electrician has invented that long-sought desideratum, a dry storage battery. So far, it appears, his apparatus has a capacity at sixty volts of one-quarter of an indicated horsepower, but he is in hopes of increasing this to 100 volts and over one-half of an indicated horsepower. There is said to be an enormous saving of weight, the accumulator only weighing a little over two-and-one-half pounds, while its prime cost and maintenance charges are correspondingly reduced. It is said to be most easy to manipulate. There is certainly a great future before such an invention, if practical.

McAdoo Tube Expansion.

The Hudson & Manhattan Railroad Company has obtained the permission of the Jersey City Street and Water Board to extend its Cortlandt Street tunnel system under Railroad Avenue to Summit Avenue.

The ordinance was adopted at a recent board meeting, but it is understood that Mayor Wittpen will veto it because no proviso is included that a five-cent fare shall hold good from any place in Jersey City to the New York terminal.

New England Section, National Electric Light Association.

The first convention of the New England Section of the National Electric Light Association was held at Newcastle, N. H., on September 8, 9 and 10. The headquarters were opened at the famous Hotel Wentworth Wednesday evening, when the larger portion of the final attendance of 150 were already registered. The convention was opened by a reception on this evening that was given in the hotel parlors by the officers of the section. Throughout the convention a great deal of interest was shown in the proceedings; a number of very good papers were read and ably discussed, and on the whole the prospects for this geographic section of the national association were shown to be very bright.

THURSDAY SESSION.

The first technical session of the convention assembled on Thursday morning at the call of President S. F. Smith. Mayor Adams of Portsmouth made a very pleasing address of welcome, after which Mr. Smith delivered his presidential address.

In President Smith's address he calls attention to the conditions that had brought about the organization of the New England Section. There had been a number of separate local organizations which were largely duplicating their work, and by their amalgamation into the New England geographic section their efforts were combined harmoniously. The New England section now has 413 members, and is the strongest geographic section of the association. Mr. Smith showed clearly the advantages of affiliation with the larger organization, and also pointed out the value to the latter of having sections organized in the various parts of the country. He advocated the plan of organizing similar geographic sections which should combine the central-station interests of a number of states having similar local conditions, and he declared that this plan was preferable to having a large number of strictly state associations.

The recommendations of the president's address were referred to a committee, of which A. J. Campbell was made chairman. A paper was then presented by W. L. Mulligan, of Springfield, Mass., its subject being "Liability Insurance and How It Affects the Employe."

In this paper Mr. Mulligan described the practice of the United Electric Light Company, of which he is general manager. This company has carried both public and employes' liability insurance for several years on the plan of handling this feature directly instead of leaving it entirely to the insurance companies. In case of injury to any employe during the carrying out of his duties, he is promptly taken care of by the company, which provides medical and hospital services without expense to him, and tries its utmost to restore him to perfect condition as rapidly as possible. Practically the entire force of employes, except those in the office, about 150 altogether, are protected by insurance of this order. It has been found that men do not hesitate to assume unpleasant duties, and are more loyal to the company since they know they are properly protected in the execution of all orders. The total amount of money required last year for all forms of insurance was $2,500, of which a little over two-thirds represented liability insurance. Cases of minor injury are handled directly by the company, without the necessity of the insurance company being put to any expense. The latter is, therefore, more liberal in adjusting the larger cases for which its aid is required. There are few cases which reach the courts by the general plan that has been followed.

The discussion of this paper consisted of the relating by a number of members of similar plans that had been put into use, and of a series of questions directed to Mr. Mulligan with reference to the details of his system. The general opinion was expressed that a liberal policy in regard to accident compensation resulted in decidedly improved loyalty of the employes. A number of speakers advocated the plan of having the central-station company carry its own insurance in a special fund of this kind. Among those who discussed the subject along these lines were H. T. Sands, of Malden, Mass.; J. E. Davidson, of Montpelier, Vt.; R. W. Rollins, Hartford, Conn.; A. J. Campbell, New London, Conn.; L. D. Gibbs, Boston, Mass.; C. D. W. Jarvis, Boston, Mass..; Mr. Wilson, of Berlin, N. H., and President Smith.

A paper entitled "The Advantages of Steam Heating for Electric Lighting Companies" was then presented by C. R. Bishop, of the American District Steam Company, of Lockport, N. Y.

Mr. Bishop's paper reviewed the gradual growth of central-station heating, and showed that New England is backward in this direction. In Pennsylvania, having eighty-two cities of over 5,000 inhabitants, there are central-heating plants in sixty-nine cities. Illinois, with fifty-one cities of over 5,000, has thirty cities having such systems. Throughout New England there are 172 cities with a population in excess of 5,000; in only three, however, is central-station heating carried out. Central heating has been perfected by recent developments and is now completely standardized. The development of correct meters has enabled the provision of fair systems of rates. The general plan followed is to have the heating season begin on October 1 and extend pretty well into May. Mr. Bishop pointed out clearly that with a properly designed heating installation the revenue derived from this service practically pays the entire costs of the power house, so that the electric current generated might be considered as a by-product. He gave interesting examples to verify these statements. He went into the details of central-station heating quite fully, and stated that it is feasible to install a system of this kind having mains as long as two miles from the power house. It is desirable to arrange the piping of the stations so that any of the engines may exhaust into the heating system, into the atmosphere or into the condenser. The marked advantage of a central-station heating system is that it permits of the entire shutting down of isolated plants, and thus removes practically the last hindrance to central-station lighting and power service. A large number of consumers were added to the central-station electric systems when it was made possible for them to receive the central-station heat as well.

Mr. Bishop's excellent paper brought out quite a number of questions with regard to central heating. It was quite evident that there is a dearth of information on this subject among the New England members, many of whom expressed their pleasure in having its possibilities opened to them. Practically all the heating is done on the low-pressure system, and seldom is more than two pounds service pressure required at any building. In a number of cities steam-turbine plants are running in connection with exhaust-steam heating equipment and giving excellent results.

FRIDAY SESSION.

At the opening of the second business session of the convention President Frueauff, of the National Electric Light Association, was introduced. He had made a special trip from Schenectady, N. Y., where the preliminary organization of the first-class "D" company section had been undertaken. He made an excellent address to the association, in which he referred to the enthusiastic meeting which he had just left, and to the great interest taken in all of the enlarged activities of the national association. Mr. Frueauff explained the work that is being carried on by the more important committees, and spoke of the library which is rapidly accumulating at the association's offices in New York city. He pointed out a number of cases where small companies are getting the direct benefit of affiliation with the association through the services of its experts at ridiculously low cost in comparison with what would have been required if the company had acted independently.

President Smith announced to the convention that T. C. Martin, who has been prominently associated with all electrical activities for the past quarter century, particularly in the journalistic field, had been induced to accept the position of permanent secretary to the National Electric Light Association. He congratulated both the national and the local associations upon the acquirement of Mr. Martin's able services in their behalf. He thereupon introduced Mr. Martin, who had come with President Frueauff.

In a short address Mr. Martin expressed his regret at leaving the field of

technical journalism. He spoke of the high importance of the work of the National Electric Light Association; of the rapidly broadening scope of its activities, and the possibilities that would be open to him in supplying information of all kinds in relation to the industry for the benefit of the various local sections and individual members of the association. In conclusion he advocated the most hearty co-operation on the part of all the members in promoting its welfare.

At this point Chairman Campbell, of the committee on the president's address, reported that it seemed desirable to place a copy of President Smith's address in the hands of each member. The committee also recommended that special efforts be made to secure friendly relations with the central-station men employed in the municipal plants.

F. W. Prince, of Hartford, Conn., then read a paper on "The Low-Voltage Tungsten Lamp in Residentlal Lighting."

In this paper Mr. Prince described the practice of the Hartford Electric Light Company in installing low-voltage tungsten lamps. The advantages of this type of lamp in comparison with the normal 110-volt tungsten lamp he declared to be very marked. The lamp is more rugged and can be handled with practically no breakage; it does not blacken, and has a useful life of nearly 2,000 hours; it can be burned at any angle, and requires only the standard ten or sixteen candlepower bulbs. Furthermore, the price of this low-voltage lamp is only about sixty-five per cent of the high-voltage tungsten. The best way to install the low-voltage system, Mr. Prince declares, is by the use of a transformer or a balance coil, with 112-volt primary and four twenty-eight-volt secondary circuits. By the provision of special primary taps the voltage could be adjusted to prevent excessive drop in long secondary circuits in large houses. The use of twenty-eight-volt circuits, however, prevented the installations of the regular flat irons, fans, sewing machines, motors and other household utilities which required separate 112-volt circuits. In order to overcome this need, a sixty-volt lamp was adopted as standard, since sixty-volt appliances were available. The Hartford company adopted a series of flat rates for installation of low-voltage tungsten lamps, and claims to have got excellent returns from this plant. Particular headway has been made on this basis in the wiring of houses formerly equipped with gas. This is usually done on the three-wire system at a very low cost.

The discussion of Mr. Prince's paper was quite spirited. In fact, it was a difficult thing to say which side of the debate, for or against the low-voltage lamps, had the best of the argument. On behalf of the low-voltage advocates it was said that a large number of consumers can be obtained in this manner which it is impossible to reach with the high-voltage tungsten-lamp proposition. There are no complaints from the customers. The costs of the economy coil, or transformer, and of the flat-rate controller are about the same as that of a meter. The energy lost in the former is fifty per cent in excess of that in the meter, but there are no maintenance, meter-reading or billing costs.

In opposition to these arguments G. C. Osborne, of the General Electric Company, said that recent improvements in both metallic and metalized-filament lamps have increased their life materially before they reach the point of twenty per cent depreciation from the initial candlepower. Along with this improvement has come a steady reduction of prices for the normal voltage lamps. He deprecated the use of low-voltage tungsten lamps for regular residential lighting, as he thought this was not a proper field for their installation.

L. D. Gibbs, of the Boston Edison Illuminating Company, also advised against the adoption of low-voltage lamps for residential lighting. He believes that even the twenty-candlepower tungsten lamp is not too bright for proper illumination. Central-station interests should rather encourage the use of the higher standard illumination than the opposite.

The session was concluded by the reading of a paper by H. I. Harriman, general manager of the Connecticut River Power Company.

This paper described the hydroelectric developments of this company. The details of the station and line equipment were gone into, and the special conditions which had to be met with described. The variable flow in this river necessitated the installation of a third turbo-generator, which operates during times of high water that results in a reduction of the available head. By this provision the plant can be operated under full load in even flood conditions. Mr. Harriman also described details relating to the distribution system, and the general operation of the entire installation.

In the discussion a number of questions were asked in regard to the provisions for non-interference with telephone circuits. Mr. Prince went into the details of this matter at some length, and spoke also of the difficulties that had to be overcome in the securing of the private right-of-way for the transmission line. The transmission extends to the city of Worcester, sixty-six miles from the plant. In case of exceedingly low water the company operates an auxiliary steam plant.

On Friday afternoon a short business session was held, at which the constitution and by-laws that had been previously drawn up for the New England section were formally adopted. After the adoption of a number of resolutions of thanks for courtesies extended to the association in connection with its meetings, the convention finally adjourned.

ENTERTAINMENT FEATURES.

One of the leading adjuncts to the success of any convention of this order is the provision of entertainment features, particularly for the ladies accompanying the members. In this regard the New England section achieved marked success by the pleasing variety and excellent arrangements that were made in this connection. During the sessions of the convention on both Thursday and Friday mornings the ladies of the party were the guests of the Portsmouth Board of Trade, which had provided an automobile trip.

On Thursday afternoon practically all the members and guests attendant on the convention had a very pleasant trip around the bay on the steamer "Alice Howard." A number of stops were made at the Navy Yard, where is located the historic conference chamber where the treaty of peace between Japan and Russia had been signed, also at the power plant of the Rockingham County Light and Power Company at Portsmouth. On Thursday evening a banquet was held in the dining room of the Hotel Wentworth. This was attended by the entire convention party, including members, ladies and guests. After partaking of a sumptuous menu in the beautifully decorated dining room, a number of excellent after-dinner addresses were made by L. D. Gibbs, of Boston, who was toastmaster; J. S. Whittaker, of Portsmouth; H. T. Sands, of Malden; C. B. Burleigh, of Boston; T. N. Brady, of New Britain, and A. J. Campbell, of New London, Conn.

Fishing By Telephone.

Consul Louis Goldschmidt, of Nantes, France, reports that a use for the telephone in fishing has been discovered in Norway. A microphone for amplifying submarine sounds is shut up in a thin, watertight steel box and connected by metallic wires with a telephone receiver on the fishing boat. It is stated that with this apparatus the fisherman is always informed of the approach of fish.

Autumn Meeting of the American Physical Society.

The autumn meeting of the American Physical Society will be held this year at Princeton University, on Saturday, October 23. This date has been chosen on account of the opening of the new Palmer Physical Laboratory, which will take place on the evening of October 22.

International Association of Municipal Electricians.

The fourteenth annual convention of the International Association of Municipal Electricians was called to order by President J. B. Yeakle at 11 a. m., Tuesday, September 14, in the convention hall of Young's Pier, Atlantic City, N. J. Mayor Stoy of Atlantic City delivered an address of welcome in which he emphasized the fact that the safety of lives and property was dependent on the members, and that too much care and attention could not be devoted to their duties. He extended the freedom of the city to all.

Past-President Thompson, of Richmond, Va., responded on behalf of the association. He stated that it was not the first time the association had met in Atlantic City, and the previous welcome was still fresh in the minds of the members. At that time, the wonderful invention of wireless telegraphy was in its infancy, and a lecture and demonstration had attracted wide attention. He thanked the mayor for the courtesy extended.

The afternoon session was opened by the president's annual address. In it he gave a brief review of the past, stating how at first the membership had been composed of fire-alarm and police-telegraph superintendents. Now the field has broadened and all classes of municipal electrical engineers have been included. The municipal electrician of today was not developed from the ranks of fire-alarm or police-telegraph superintendents. He must have a broader education and be capable of attacking much more complicated problems. The underground systems and the troubles incident thereto were quoted as illustrations. He advocated the training of men for all such positions and spoke of the advantages gained by joining such associations as this and the American Institute of Electrical Engineers.

Following the president's address C. S. Downs, of Altoona, Pa., read a paper on "Grounding of Alternating-Current Secondaries." In this he alluded to the great danger arising from failure of insulation on primary and secondary circuits. This could be avoided by grounding, and he presented a resolution that the association demand the enactment of legislation requiring the grounding of alternating-current secondaries, when the voltage between the earth and any part of the secondary system will not exceed 250 volts. In the discussion which followed several instances were cited where loss of life, which could have been avoided, had resulted from the non-grounding of such circuits. There was shown a disposition to object to the rather arbitrary resolution demanding legislation on the subject, but it was carried. Mr. Downs asked that the association suggest some form of standard ground, but no action was taken on this suggestion.

At the opening of the third session, that of Wednesday morning, Messrs. Kingsbury, Ellett and Diehl were appointed a committee on exhibits. R. A. Smith, of Norfolk, Va., read a paper on "The National Electrical Code, its Proper Interpretation and Bearing on Fire Alarms and Police-Signal Work." In it the author said he wished to bring out the rules which are so often misunderstood, especially those bearing on fire and police-signal work. The fire and police central-office wiring is often far from being what is required by the Code, suitable fireproof racks and cabinets being conspicuous by their absence, high-tension and sneak-current protectors not being provided and often bell wiring being used to carry heavy voltage currents. The source of energy often being a trolley circuit, with its voltage above 500 and one side grounded, it could be easily seen that the protection necessary must be of the best. The proper observance and interpetation of this and other rules of the Code, relating to line work and lighting in general, are of vast importance to the city electrician, and he will find constant study and application necessary in order to keep abreast of the march of improvements and changes in the rules.

Discussing the paper, several members spoke of the occasional conflict of district and national committees' rules. On motion the president was empowered to appoint a committee to represent the association at the meetings of the National Conference on Electrical Rules. The president appointed the following committee on nominations: H. C. Bundy, Jas. Warren, J. C. Simpson, C. E. George, R. A. Smith.

A paper on the "Progress of the Fire-Alarm Telegraph" was next read by S. W. Manning, of St. Paul. Mr. Manning's paper reviewed the development of this branch of telegraphy since the adaptation of the Morse telegraph in 1851. Among the improvements noted were the Gamewell fire-alarm box and its development into the perfect non-interfering succession fire-alarm box; the use of storage batteries; the non-interfering firm-alarm repeater; use of the punching register, and improvements in the central office, such as the manual transmitter, the automatic line tester and reliable protection from abnormal potentials.

This paper was followed by H. C. Bundy, of Syracuse, with a paper on "Telephones and Their General Use for Fire Alarms." He decried the use of telephones for sending alarms, as many serious mistakes had happened by misunderstanding the names of streets. If it was to be adopted, a specially trained operator should be stationed at the exchange to take care of such calls. In the ensuing discussion the majority of members agreed with Mr. Bundy.

The Wednesday afternoon session was opened by a demonstration of a device for determining when insulation is growing weak. After this, A. C. Farrand, of Atlantic City, read a paper on "Locating Faults on Fire and Police-Telegraph Lines without Opening the Circuits." He illustrated and described his plan at length. This was commented upon favorably by the members.

W. S. Devlin, of New Castle, Pa., then read a paper on "The Construction of Underground Conduits." In this paper he briefly described the three types of conduit construction most commonly used, the cement duct, the clay duct and the fiber duct. He also pointed out the precautions to be observed in all conduit construction and the proper order of procedure. Manhole construction was also briefly commented on. In the discussion of Mr. Devlin's paper some advocated oval manholes without corners to avoid bending of cable. Various means of protecting cables were also suggested.

At the Thursday morning session a paper by Mr. Dixon on "Storage Batteries for Fire and Police Telegraphs" was read and demonstrated by means of a model battery. In the discussion the matter of covers for the jars was brought up and some favored glass in preference to porcelain for this purpose. A query was submitted whether in a system with a great number of circuits where the power plant is a storage battery, it would be considered entirely safe to have one battery of large capacity supplying currents to all circuits through a busbar, with a duplicate set in reserve, one set charging while the other is in use. The impression seemed to be that the scheme would not be good practice. In the general remarks that followed a member stated that the membership of the association represented

cities having a combined population of 25,000,000 persons.

At the session on Thursday afternoon the nominating committee presented the following names, and upon motion the secretary was instructed to cast a ballot for these gentlemen for the various offices to be filled for the ensuing year:

President, J. B. Yeakle, Baltimore, Md.

First vice-president, J. S. Craig, Toronto, Can.

Second vice-president, A. L. Kittredge, New Haven, Conn.

Third vice-president, A. J. Bell, New Rochelle, N. Y.

Fourth vice-president, C. S. McCosker, Mobile, Ala.

Secretary, F. P. Foster, Corning, N. Y.

Treasurer, C. E. Diehl, Harrisburg, Pa.

Executive committee: S. W. Manning, St. Paul; H. G. Kennedy, Rochester; H. L. Kingsbury, Baltimore; O. M. Schaefer, Trenton, N. J.; A. L. Pierce, Wallingford, Conn.; J. C. Simpson, Washington, D. C.; Clarence George, Houston, Tex.; C. S. Downs, Altoona, Pa.; J. W. Kelly, Camden, N. J.

Finance committee: T. C. O'Hearn, Cambridge, Mass.; J. Murphy, Cleveland, O., and O. F. Gall.

A motion was passed recommending that at future conventions the association hold four days' sessions instead of three. Also that the executive committee prepare a certificate of membership. Rochester, N. Y., was chosen as the place for the next convention, the date to be set by the executive committee.

The local chairman, A. C. Farr, of Atlantic City, deserves great credit for the very interesting programme of entertainment provided for the members and friends. The ladies especially were well provided for.

Among the municipal electricians and their guests who were registered as in attendance at the convention were the following, the name of the city being given first:

Albany, N. Y.—J. J. Gillespie.
Allentown, Pa.—P. J. Beisel.
Altoona, Pa.—Mr. and Mrs. C. S. Downs.
Atlantic City, N. J.—Mr. and Mrs. A. C. Farrand, Mr. and Mrs. E. M. Plummer, Mr. and Mrs. E. E. Ingalls, Mr. and Mrs. T. W. Garey, W. L. Crook, D. B. Scarborough, Horace Turner.
Baltimore, Md.—Mr. and Mrs. J. B. Yeakle and Miss Yeakle, Mr. and Mrs. Lester Kingsbury.
Bayonne, N. J.—Mr. and Mrs. R. Arbuckle and Master Arbuckle.
Boonton, N. J.—James Dixon.
Bridgeport, Conn.—F. O. Snow.
Bristol, Pa.—Frank T. Chambers.
Bristol, R. I.—P. F. Lyons.
Cambridge, Mass.—Timothy C. O'Hearn.
Camden, N. J.—John W. Kelly.
Charleston, S. C.—Ion Simmons.
Chicago, Ill.—Frank F. Stover, H. D. Fargo, H. B. McMeal.
Cleveland, O.—Jerry Murphy.
Corning, N. Y.—Mr. and Mrs. Frank P. Foster, John W. McCarthy.
Detroit, Mich.—Louis Gascoigne.
Elizabeth, N. J.—M. L. Van Houten.
Elmira, N. Y.—Mr. and Mrs. Will Y. Ellett.
Erie, Pa.—William Crane.
Harrisburg, Pa.—Mr. and Mrs. C. E. Diehl and Miss Diehl.
Houston, Tex.—Mr. and Mrs. Clarence R. George.
Louisville, Ky.—C. F. Gall, P. G. Kern.
Meadville, Pa.—A. J. Balizet.
Minneapolis, Minn.—Z. F. Morrison.
Mobile, Ala.—C. S. McCosker.
Morristown, N. J.—Mr. and Mrs. Frank E. Pierson.
Mount Vernon, N. Y.—W. H. Flandreau.
New Castle, Pa.—Wm. S. Devlin.
New Haven, Conn.—Mr. and Mrs. James Grant.
New Rochelle, N. Y.—Mr. and Mrs. A. J. Bell.
Newark, N. J.—Mr. and Mrs. Adam Bosch and Miss Bosch.
New York, N. Y.—E. C. Chamberlain, Albert H. Cross, A. P. Eckert, J. A. Nerr, C. C. Johnson, James F. Kinder, Romaine Mace, H. G. Madden, T. Mahoney, George T. Manson, Joseph Maxwell, P. W. Miller, W. J. Minidell, Mr. and Mrs. Frederick Pearce, Charles W. Price, Harry E. Reid, Richard C. Smith, V. Stanley, Mr. and Mrs. J. B. Taltavall and Miss Taltavall, G. L. Wiley.
Norfolk, Va.—R. A. Smith, L. R. Willis.
Ottawa, Can.—Miss Garfoot, G. F. Macdonald.
Peoria, Ill.—W. E. Wolgamott.
Philadelphia, Pa.—F. W. Hall, T. E. Hughes, Charles S. Redding, Julius Bernstein.
Pittsburg, Pa.—Elmer Loomis, G. L. Ross, J. M. Spader.
Reading, Pa.—W. C. Matthias.
Richmond, Va.—W. H. Thompson and Master Thompson.
Rochester, N. Y.—H. G. Kennedy, Joseph B. Smith.
Scranton, Pa.—Mr. and Mrs. W. J. Neare.
St. Louis, Mo.—Robert Quain.
St. Paul, Minn.—Mr. and Mrs. Stanley W. Manning.
Syracuse, N. Y.—M. J. Myers.
Toledo, O.—Mr. and Mrs. Mark Winchester.
Toronto, Ont.—Mr. and Mrs. John S. Craig.
Trenton, N. J.—Mr. and Mrs. O. M. Schaefer.
Wallingford, Conn.—Mr. and Mrs. A. L. Pierce.
Washington, D. C.—Mr. and Mrs. James Simpson.
Watertown, N. Y.—H. C. Bundy.
York, Pa.—Warren E. Fastnacht.

Among the manufacturers exhibiting appliances and other companies represented at the convention were the following:

Queen & Company, Inc., Philadelphia, exhibiting testing instruments of various kinds.
Safety Insulated Wire and Cable Company, New York, represented by R. C. Wilson, R. C. Smith and W. H. Rodier.
National District Telegraph Company, New York, represented by C. C. Johnson, superintendent, and Joseph Maxwell, assistant superintendent.
Frederick Pearce Company, New York, represented by Frederick Pearce; the company's fire-alarm and police instruments were exhibited.
Gould Storage Battery Company, New York, represented by H. N. Powers.
National India Rubber Company, Bristol, R. I., represented by Avery P. Eckert, New York.
Okonite Company, New York, represented by George T. Manson and Romaine Mace.
Westinghouse Storage Battery Company, Boonton, N. J., represented by A. C. Farrand, chief engineer, of Atlantic City.
Walker Company, Philadelphia, represented by Mr. Boyd; the company exhibited its non-replaceable fuse device.
Kerite Insulated Wire and Cable Company, New York, represented by P. W. Miller.
Standard Underground Cable Company, Pittsburg, represented by George L. Wiley of New York.
Sprague Electric Company, New York, represented by F. W. Hall and Joseph A. Herr of Philadelphia; exhibited flexible-steel conduit and armored-steel conductors.
Gamewell Fire-Alarm Telegraph Company, New York; exhibited its fire-alarm system.
Leeds & Northrup Company, Philadelphia; exhibited electrical measuring instruments and distributed some interesting literature.
Duplex Metals Company, New York, represented by H. G. Madden, who gave out a dainty little souvenir.

Bond Issue Authorized.

The Albany & Southern Railroad Company has been authorized by the New York Public Service Commission to issue $1,375,000 of its common capital stock and $2,029,000 of its preferred stock to acquire the property of the Albany & Hudson Railroad Company, recently reorganized as the Albany & Southern.

Fulton Exhibit at the Engineering Societies Building.

The Hudson-Fulton celebration is essentially a recognition of the explorer and the engineer. To show the relation of the latter to the celebration, models of the Clermont and other early steamboats, through the courtesy of the Smithsonian Institution, are now on exhibition at the rooms of the American Society of Mechanical Engineers in the Engineering Societies Building, 29 West Thirty-ninth Street, New York city. The exhibit includes the Clermont; the Phoenix, built by John Stevens; and one of John Fitch's early types. Original drawings by Fulton, an oil portrait of Fulton painted by himself, Fulton's dining table, oil portraits and bronze bust of John Ericsson, models of the Monitor, all owned by the society, and Ericsson's personal exhibit at the Centennial Exposition, are also exhibited. Through the courtesy of the Hamburg-American line, a beautiful model of the Deutschland is also shown for the sake of comparison with latter-day practice.

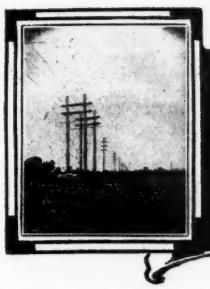
The exhibition will be open to the public every week day from 9 a. m. to 5 p. m.

International Traction Company.

A report recently current regarding the International Traction Company is to the effect that there is soon to be a readjustment of the company's affairs, while another has it that back dividends are to be paid shortly. It seems reasonably certain that some action will be taken in the near future, and it looks more like a readjustment than an immediate payment of back dividends.

The International Traction Company owns the entire capital stock of the International Railway Company, which operates the street railways in Buffalo and vicinity, and dividends, if paid, must come from the operation of the railway. The traction company has now due and unpaid accumulated dividends for the past ten years, amounting to a total of forty per cent. For the past three years earnings have shown a steady decline, last year surpassing the others in this respect; and this, in spite of the fact that operating expenses were considerably reduced.

At the end of the last fiscal year earnings of the railway company applicable for dividends amounted to only $172,291, comparing with $312,260 for the year before, a decrease of $139,959. This is not enough to meet the preferred dividends of four per cent on $5,000,000 of preferred stock to the proprietary company.



CENTRAL-STATION PRACTICE

Transmission—Interior Wiring.

RISE OF GENERATOR CAPACITY.

BY ALTON D. ADAMS.

Great changes have taken place in the capacity and types of electric generators in central stations during the past score of years, and their full scope is hard to appreciate without the figures before us. Such figures are best understood when coupled with the facts as to methods of driving, kinds and amounts of loads, and extensions of service areas.

A typical record of the changes of generators in the electrical supply system of one of our great cities is here presented, and a diagram has been prepared to bring out the relation of time to their types, capacities and voltages.

The base line of this diagram scales a score of years from 1888 to 1908 inclusive, and the ordinates measure the capacity in kilowatts of the generators connected to the electrical supply system. Each horizontal line parallel with the base indicates the generator capacity of the system in kilowatts from the earlier year at which the line starts to the date of the next increase of capacity, and all of these horizontal lines are carried through to 1908, so that the amount and type of each increment of capacity added up to any given year may be seen at a glance. Horizontal lines starting in 1888 and 1890 are not carried through to 1908, however, because the generators of these years were of the same type as those added in 1891.

The electrical supply system under consideration had, in 1888, two generating stations where city water was used in the boilers and was the only supply available for condensing, though all of the steam engines were of the high-speed, simple, non-condensing type. Neither of these two stations had connection with railway or water transportation, and both coal and ashes had to be carted. In 1892, a third station, located on navigable water, began to operate and before 1902 a fourth station, also located on the water front, was added to the system. Since 1891, all additions to the generator capacity have been made at the two stations on tide-water, and after 1893 the use of the first two stations for generating purposes rapidly diminished.

In 1888 the electrical supply system had sixteen bi-polar dynamos of fifty kilowatts each and six of 37.5 kilowatts each, at 125 volts, in its two generating stations, and by 1891 the number of dynamos had increased to sixty-four of fifty kilowatts each and of the above type. These sixty-four, 125-volt dynamos were connected to a three-wire system of underground distribution in the heart of the city, and this system was almost if not entirely within a one-half-mile radius of at least one of the generating stations. Besides more than 44,000 commercial incandescent lamps and some 197 arc lamps, this electric system had motors of more than 2,000 horsepower aggregate capacity, connected in 1891.

When the first two generating stations reached the aggregate capacity of 3,200 kilowatts, in 1891, it was evident that further extensions at these sites would be unwise, because the advantage of short radii of distribution was more than offset by the cartage of fuel and lack of condensing water. The location of the third station on the water front was more than one mile from same points in the distributing system and thus created a demand for somewhat higher voltage. Accordingly the first eight generators of 200 kilowatts each, installed at this third station by 1893, had their capacity based on 160 instead of 125 volts, so that more pressure would be available for loss in the feeders.

Constantly increasing load made it desirable to give the capacity of 200 kilowatts to each of these eight generators so as to keep down the number of units, and they were direct-connected in pairs to their engines, instead of being belted like the sixty-four fifty-kilowatt dynamos. The steam engines for the 200-kilowatt generators were vertical and triple expansion, and operated condensing.

A desire to keep down the number of units is seen again in the selection of the 400-kilowatt generators, added by 1896, and their voltage was put at 160 for the reason just given. The 160-volt generators, like the bi-polar 125-volt machines, were connected in pairs to the three-wire system, the connection between each pair being joined to the third wire.

By 1900, further capacity was added, and the policy of doubling the size of the largest previous units gave generators of 800 kilowatts each in this year. With these two 800-kilowatt machines the generator capacity of 1900 reached 7,200 kilowatts, instead of the 3,200 kilowatts in 1891, and out of the total of forty-four generators the increase of 4,000 kilowatts was made with twelve. The 400-kilowatt units of 1896 and the 800-kilowatt units of 1900 were direct-connected to vertical compound engines, leaving the triple-expansion engines of 1893 the only examples of that type in the system.

A point of novelty in the 800-kilowatt generators was their design for 300 volts each, so as to be connected only to the two outside wires of the three-wire system, the smaller machines of 125 to 160 volts being more than sufficient to balance the loads on the opposite sides of the third wire. It was not necessary that the voltage of 300 be double the 160 volts of the earlier generators at the third station, for boosters were brought into use to supply extra pressure to compensate for the loss in feeders to some extent.

The year 1901 found a generator of 1,600 kilowatts at 300 volts added to the equipment of the station on the water front, thus doubling the capacity of the largest existing unit for the fourth time in eight years, and the following year saw a duplicate of this 1,600 kilowatt generator installed. A feature of interest in the 1,600-kilowatt generator of 1902 is its double current character which is obtained by the use of a commutator connected at one end of the armature and six collector rings at the other. This generator has thirty poles and operates at 100 revolutions per minute, so that it will deliver six-phase alternating current of twenty-five cycles per second, besides direct current. While this alternating current is generated at only 184 volts, it

can obviously be raised by transformers to any pressure desired for transmission to substations or elsewhere.

Prior to 1902 the electrical supply system under consideration had been operated entirely on the three-wire direct-current plan with the great bulk of its connected load located within one mile of the water-front station where most of the energy was generated. By means of two-wire tie lines at about 300 volts between this main generating plant and a number of substations, supplemented by storage batteries and boosters, besides the ordinary feeders into the network of service mains, the voltage of supply was regulated.

The connected load of this three-wire electrical supply system, in 1901, included above 2,300 commercial arc lamps, nearly 248,000 incandescent lamps and motors aggregating more than 10,600 horsepower. Compared with the connected load of 1891, the number of arc lamps was more than eleven times as great, and the number of incandescent lamps and the total horsepower of motors were more than five times as great, respectively, in 1901.

During this same decade, the number of generators in the system, at 125 to 300 volts each, increased from sixty-four with an aggregate capacity of 3,200 kilowatts, in 1891, to seventy-eight with an aggregate capacity of 10,400 kilowatts, in 1901, and in this later year nearly all the energy was generated with the fourteen generators of 7,200 kilowatts total capacity that had been added since 1891. In this last statement of capacity is included the 1,600-kilowatt generator of 1902, as it was actually in position before the close of 1901. While the increase of load just named was going on, the generators had thus risen to more than three times their total capacity in 1891.

Before the beginning of this three-wire system in 1888, several electric stations using arc dynamos had been started in the same city, two of them in 1883, and after the consolidation of these several arc stations, about 1886, incandescent lighting with alternating current and the operation of motors with direct current at about 500 volts were extensively developed by the combined plants. In 1901, the system that had been built up from the combination of stations that were devoted mainly to arc lighting had a connected load of 4,913 arc lamps, of which 2,885 were devoted to street lighting, more than 112,000 commercial incandescent lamps, and electric motors of above 5,400 total horsepower. While this load was confined to the city limits, it was distributed over a much wider area than that of the three-wire system above described.

By 1901 most of the equipment of the early arc-lighting stations had been discarded, and the arc, alternating current and power loads just mentioned were operated in the main from a station on the water front containing six alternators, each rated at 1,500 kilowatts and 2,250 volts, sixty-cycle and three-phase. These alternators were direct-connected to an equal number of vertical compound condensing engines.

The time had now come for the combination of the above competing systems, and this was brought about in 1902, so that the six 1,500-kilowatt alternators, representing 9,000 kilowatts, were added to the 10,400 kilowatts of direct-current generating capacity in the three-wire system, during that year, giving a total capacity of approximately 19,000 kilowatts.

In 1903, two more of the 1,600-kilowatt, 300-volt, direct-current generators were added to the equipment of the three-wire station on the water front, and up to the present year no further machines of this type have come into the system.

Before 1905, an important change was made in the type of generators by the erection of two steam-turbine units at the station where the 1,500-kilowatt alternators were located. Each of these turbine units was rated at 5,000 kilowatts and 6,900 volts, at sixty cycles per second, three-phase. At about this time the system supplied by the above generating stations had been extended to a number of cities and towns that were in some cases twenty to twenty-five miles distant, and the voltage of the turbine generators was applied directly to the transmission lines. Current from these turbine units is also reduced by transformers to about 2,300 volts for distribution about the city.

The year 1907 saw a third turbine generator like each of the other two added to the system.

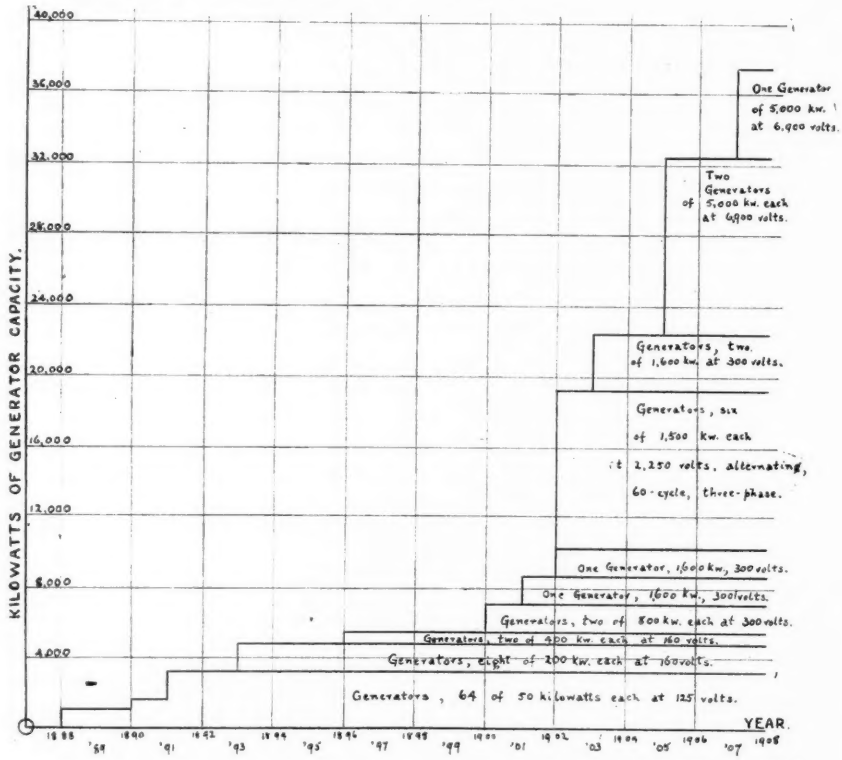

KILOWATTS OF GENERATOR CAPACITY.
40,000
36,000
32,000
28,000
24,000
20,000
16,000
12,000
8,000
4,000
One Generator of 5,000 kw. at 6,900 volts.
Two Generators of 5,000 kw. each at 6900 volts.
Generators, two of 1,600 kw. at 300 volts.
Generators, six of 1,500 kw. each at 2,250 volts, alternating, 60-cycle, three-phase.
One Generator, 1,600 kw., 300 volts.
One Generator, 1,600 kw., 300 volts.
Generators, two of 500 kw. each at 300 volts.
Generators, two of 400 kw. each at 160 volts.
Generators, eight of 200 kw. each at 160 volts.
Generators, 64 of 50 kilowatts each at 125 volts.
YEAR.
1888 '89 1890 '91 1892 '93 1894 '95 1896 '97 1898 '99 1900 '01 1902 '03 1904 '05 1906 '07 1908

CHART SHOWING TOTAL GENERATOR CAPACITIES IN DIFFERENT YEARS.

Since 1882, the generating capacity of all the electrical supply systems in the city under consideration has grown from nothing to fully 39,400 kilowatts, and its radius of service has extended to more than twenty-five miles.

Development of Waterpower in India.

According to Consul-General William H. Michael, at Calcutta, the government of India has given out the information that there are at present no laws relating to the development and use of waterpower in India, and that the terms of licenses granted for waterpower schemes for the generation of electrical energy are settled by special agreement between the applicant and the government.

A New Battery-Charging Device.

A dispatch from San Jose, Cal., states that Prof. John J. Montgomery, of Santa Clara, has invented a device by means of which storage batteries can be charged with the common low-voltage currents used in residences. The invention is more particularly useful for users of automobiles and power boats driven by electricity, but is almost a necessity for all users of storage batteries.

Owners of electric automobiles are at present forced to seek a garage which possesses a mercury rectifier, which costs something like $200. It is, moreover, very delicate, and the expansion of the globe under the influence of its own heat often breaks the glass, rendering it useless. Hence, few garages have rectifiers.

Professor Montgomery's apparatus may be attached to an electric-lighting wire anywhere at night, and in the morning the car will be ready for use. The charging current may be turned on whenever the car is not in use, insuring plenty of power for every emergency.

Professor Montgomery is instructor of electrical engineering at Santa Clara College and was experimenting with wireless telegraph and telephone apparatus in the college laboratories when he discovered the value of a portion of the instrument for recharging batteries.

American Waterpowers.

Two papers on waterpowers, prepared for the report of the National Conservation Commission, by W. M. Steuart and M. O. Leighton, of the United States Geological Survey, give statistics as to the total amount of waterpower in the United States, developed and undeveloped. More than five-and-one-third million horsepower has been developed, the average per wheel being about 100 horsepower. There are ten powers of more than 40,000 horsepower, six of more than 60,000 and three of 100,000 or more. Pennsylvania has the greatest number—3,721—and New York is next, with 3,148.

A conservative estimate of the undeveloped power is that, if all practicable storage sites were utilized and the water properly applied, there might be established eventually a total installation of at least 200,000,000 horsepower. The region offering the greatest possibilities of waterpower development is the northern Pacific, which includes the basin of the Columbia and Sacramento rivers, the possibilities there being about one-third of those of the whole United States.

New York Subway Situation.

With the semi-weekly conferences between Theodore P. Shonts, president of the Interborough Rapid Transit Company, and William R. Willcox, chairman of the Public Service Commission, a new era of subway construction is to be looked for. Although the conferences have not up to the present time developed any definite points, it is generally understood that the two parties are coming to a better understanding of the situation, and such phrases as "inadequate facilities" and "monopolistic control" will shortly be a thing of the past.

The commission has laid out and proposes to advertise for bids at once for the Broadway-Lexington Avenue system, which it is estimated will cost over $100,000,000. This line will provide for a four-track subway running from the Battery to the Harlem River and through the Bronx in two branches, one going northeasterly to Pelham Bay Park and the other through Jerome Avenue to Woodlawn Cemetery. It also provides for a new cross-town subway through Canal Street from the Hudson River to the East River. This line will connect with a line going over the Manhattan Bridge and with the Fourth Avenue, Brooklyn, subway in Brooklyn, and includes the construction of the Brooklyn loop and the two branches of the Fourth Avenue subway to Fort Hamilton and Coney Island.

Copper Output in Japan.

In the last ten years Japan's output of copper has increased from 27,560 pounds to 44,751,722 pounds a year, giving the country fourth rank as a producer of the metal. This is due to an open-minded policy regarding new mining methods and a national willingness to learn.

There are about 200 copper mines on the Japanese islands, the Ashio, in the province of Shimotsake, being the largest and the Kosaka, in the Rikuchu district, coming second. Both of these mines are now producing about 1,000,000 pounds of fine copper a month, and net their operators close to $4,000,000 a year.

Copper is the most important metallic resource of the Nipponese, and averages a high degree of purity, sometimes reaching 99.96. Only about a quarter of the copper mined is used locally, the balance being exported. Last year $10,627,506 worth was shipped abroad, of which amount $1,654,246 came to this country.

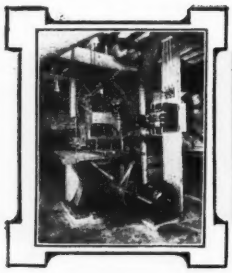
Electrical Sterilization of Drinking Water in Dwellings.

The Felten & Guilleaume-Lahmeyer Company has put on the market a small apparatus for sterilizing drinking water in dwellings by ozone. This may be easily attached to ordinary faucets in houses having an electric-light circuit. The apparatus comprises an electric ozonizer and a sterilizer, in which the water is mixed with the ozone as it leaves the faucet. The ozonizer consists of an aluminum plate and a glass plate covered by a metallic envelope. Electric discharges produced by the aid of a small transformer pass between these plates. The transformer and ozonizer are contained in a case conveniently connected to the ground in order to eliminate all possible danger.

When the faucet is opened a membrane makes a contact and automatically puts the transformer in circuit, and discharges are produced between the plates, which transform the oxygen of the air into ozone. The ozone is aspirated through a thin metal pipe and led into a mixing tube screwed to the water faucet. This tube contains a small pump and several compartments formed by perforated metal pieces arranged over each other. The water jet thus divides itself into numerous thin threads and drops and is mixed with the ozone. This intimate mixture is necessary in order to obtain an immediate sterilization of the liquid, as its contact with the ozone is of very short duration. The mixing tube offers the advantage that even with low water pressure a sufficient quantity of ozone is aspirated to destroy the germs. In a test it was found that a pressure of one kilogramme per square centimetre was sufficient to reduce the number of germs present in one cubic centimetre of water from 43,000 to eleven units. Current is consumed only when the faucet is opened, and the consumption is less than that of an ordinary sixteen-candlepower incandescent electric lamp.—*Translated and abstracted from L'Electricien (Paris), August 14.*

Telephone Concession Canceled.

President Gomez has issued a decree canceling the contract of the Havana Telephone Company for the exclusive right in Havana and empowering the Cuban Telephone Company to establish local and long-distance systems in accordance with the telephone law passed by Congress July 18.



Industrial Power

Electric Hoist for Handling Pier Cars.

The coal shipping terminal at Sewall's Point, near Norfolk, Va., of the newly opened Virginia Railway just completed by the late H. H. Rogers at a cost of over $40,000,000, is operated in a novel manner and contains some very interesting machinery, including a 1,000-horsepower electric hoist designed and built for the purpose by the Lidgerwood Manufacturing Company, of New York.

The pier has a capacity for handling thirty cars per hour, 15,000 tons in ten hours, or 4,500,000 tons per year of 300 working days. Eventually the plan calls for four such piers giving a capacity of 18,000,000 tons a year.

The design of the pier and equipment was adopted so as to enable the company to bring coal from the West Virginia mines to the seaboard in gondola cars which could be utilized for taking other freight westward. As the road expects eventually to have fully 5,000 cars in service, this was considered particularly desirable.

The terminal designed will not only be the largest for its purpose in the world, but it is the most up-to-date in every part of its equipment.

The coal pier is 1,860 feet long from the shore line to the main harbor channel. It is of steel resting on concrete foundations. The operation of getting the coal from the cars that bring it to tidewater into the hoppers from which vessels are loading comprises two operations. In the first of these the cars are allowed to drift down by gravity, one by one, to where a barney car can pick them up and carry them up a short incline to a dumper. The dumper picks each car up bodily, tips it to an angle of sixty-five degrees, so that the coal is poured out into a special conveyor car of larger capacity, to be taken to the hoppers on the pier. There are ten of these special conveyor cars. They are the largest cars of this kind ever constructed. They are of steel, with hopper bottoms, and each carries a load of 100,000 pounds of coal. As soon as each conveyor car is loaded it is taken in hand by the big hoist, which, by means of a barney car, draws it up a twenty-five per cent incline at a speed of 480 feet per minute. The incline is 480 feet long. It takes forty-five seconds for the car to reach the knuckle. Once upon the higher level, and past the "knuckle" of the incline, the conveyor car proceeds down the pier under its own power, as each is equipped with electric motors, taking power from an overhead trolley and controlled from a cab at one end. The big hoist returns the barney car to the foot of the incline, ready for another trip, at a speed of 555 feet per minute. The round trip is made in one minute and twenty seconds. The conveyor car goes to hoppers along the pier and deposits its load wherever it is wanted. The hopper bottoms of the cars are operated by compressed air supplied by automatic electric compressors on the cars.

Having deposited its load, the conveyor car returns by a kickback system, which allows it to drift back down a gentle incline to the bottom of the slope, to be refilled.

The Lidgerwood hoist which hauls the conveyor cars up the incline is an interesting part of the equipment. Each conveyor car with its load weighs nearly 200,000 pounds. The hoist complete, with its two motors, weighs 180,000 pounds. But one motor is used at a time, the other being provided to insure constant operation. The motors are of the General Electric Company's make, of the M. P. C. class. They are rated at 550 horsepower and actually develop 980 horsepower each. The drum is eighty-four inches in diameter, with a face of forty-two-and-one-half inches in width, grooved for a one-and-three-fourths-inch main cable and having also a section with a seven-inch face grooved for a three-fourths-inch tail rope, for insuring the return of the barney car. The flanges are six inches in depth. The main gear wheel is 116 inches in diameter. The pinion which drives this is nineteen inches in diameter. The intermediate gear wheel is seventy-two inches in diameter, with a twenty-one-inch pinion. All the gears are of cast steel, with machine-cut teeth.

The drum has powerful post brakes. These are controlled by a solenoid through the medium of compressed air. The compressed air is supplied at a pressure of thirty pounds to the inch by an electric compressor, which forms part of the hoist outfit. The general operation of the hoist is controlled by an operator near the barney-car pit, 350 feet distant from the hoist, but the hoist is provided with an emergency limit switch, which makes certain that it cannot overwind in either direction. The brake is set by a weight of 1,400 pounds acting upon a suitable lever. When the current is turned on, the solenoid acts and, by means of the compressed air, releases the brake. When the current is cut off, whether by intention or accident, the solenoid drops, releases the air, and the weight brings the brake into action, holding the load safely in any position.

Southern Expansion.

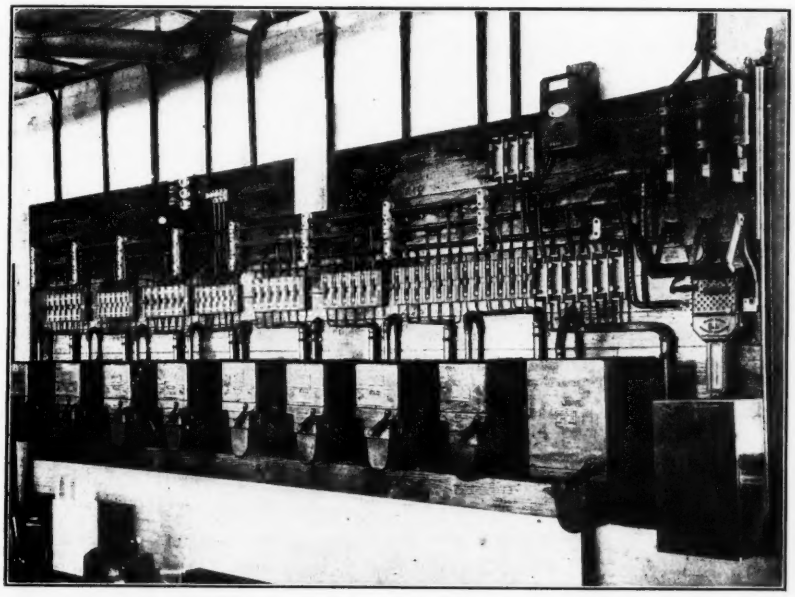
Memphis, Tenn., advices state that the Southern Steel Company has awarded to the Northern Electric Company a contract for electrical equipment costing $75,000, and it is said a contract has been given for electrical cars valued at $65,000. Various small contracts for necessities to extend the open-hearth mill at Gadsden are being given without any let up. The company has purchased from the Tennessee Coal, Iron and Railroad Company all the coke output of that company in Tennessee for the remainder of this year. This coke is for consumption at Gadsden.

From China.

The Canton authorities have completed arrangements for the purchase of the Canton electric-light works, which they will soon take over from the China Light and Power Company. The purchase price is $553,520 gold, one-half of which will be furnished by the provincial government, the other half by Chinese individuals.

Switchboard for Group Electric Drive.

The accompanying illustration shows the controlling switchboard in the factory of the Wilmarth Show Case Company, Grand Rapids, Mich., where the woodworking machinery is operated by means of group, instead of individual, electric drive. In this installation all the controllers for the factory are grouped and labeled, so that motors for different sets of machines can be started and stopped from one point. Thanks are due to F. M. Feiker, technical editor of *Factory*, a well-known magazine of organization and equipment, published in Chicago, for the loan of the photograph from which the illustrative halftone was made.



SWITCHBOARD FOR GROUP DRIVE AT THE WILMARTH SHOW CASE COMPANY'S WORKS, GRAND RAPIDS, MICH.

A New Electric Meter.

Professor Fery, of Paris, has recently constructed an apparatus based on the same principle as the Aron pendulum meter, but differing greatly therefrom in mechanical arrangement. The meter comprises two independent sets of apparatus which may be installed at a distance from one another. One of them is a system of two equal pendulums, in which the mass consists of a curved solenoid with iron core. In the center of each core there is a polarized block which is exposed to the effect of a fixed coil opposite the lowest point of the pendulum's travel through which the current flows. The movable solenoids of both pendulums are polarized by a weak current derived from the tension. The peculiarity of the pendulums is that they do not come in contact with any fixed parts. To make this possible a small auxiliary pendulum is used, the mass of which consists of a bare copper ring, into the end of which the end of the pendulum-solenoid projects.

The oscillation of the auxiliary pendulum is displaced by one-quarter period with respect to that of the main pendulum; when the latter therefore reaches its maximum velocity, the auxiliary pendulum is at its minimum. The contacts are made by the auxiliary pendulum. One of them serves for sending a weak current into one of the fixed coils surrounding the other pole of the solenoid, during one-half oscillation. The other contact sends a current through the second part of the apparatus, the function of which is the addition of the oscillations of the pendulums.

The adding device is a rotary-field motor, the stator of which carries four poles. Two of its coils are traversed by the interrupted currents of one pendulum, and the other two coils by those of the other pendulum. When the current impulses of one pendulum arrive before those of the other, the rotor will revolve, say, from left to right. The rotation will change in direction, when the second pendulum has come up to and passed the first. The rotor revolves only by the small angle necessary for advancing the integrating clockwork by one tooth by means of a thumb and lever. The pendulums start automatically as soon as current flows through the apparatus; they require very little energy for maintaining their movement and there is no friction between moving parts.—*Abstracted from Elektrotechnischer Anzeiger (Berlin), August 25, 1909.*

Protecting Underground Cables in Collieries.

In a letter to the editor, which was printed in a recent number of *Electrical Engineering*, of London, Eng., Walter Winsborough, electrical engineer to the Douglas Bank Colliery Company, of Wigan, Lancashire, gives a brief account of the methods he adopts in his practice for protecting the underground cables, and of the earthing arrangements.

The system of which Mr. Winsborough has charge, is three-phase, 500 volts, forty cycles, and is used for haulage, pumping and lighting. There are two sets of bitumen cables running from the power house down the shaft in casing to the top mine to cast-iron distribution boxes at pit eye "main intake," and from there by three-core bitumen cables armored, taped and braided to the motors, etc., which are all situated in the main intake roads.

The cables are run behind the bar legs, which is a splendid protection from falls of roof, etc., and suspended by leather suspenders. These cables have been installed nearly six years, and have never been crushed by falls of roof or runs of tubs. At all junction and distribution boxes there is a cast-iron dividing box clamped to the armor on either side, and these are connected to the boxes and across to the opposite dividing box, which makes the earthing continuous right through the whole system. All motors, switches, fuse boxes and transformers are earthed to the armoring, which is connected to an earth plate in the main lodge at pit bottom, and also to the pump stocks which run into the canal at pit bank.

There is also on the main switchboard a leakage indicator, which is always in circuit, and readings are taken and booked every hour. Mr. Winsborough frequently makes a test from the far end of each system which immediately indicates at the power house. He has also an electrician on duty at each mine during the day, and one during the night, who have to make a daily report. The whole of the installation is inspected once a week either by himself or one of his assistants, and he thinks that if proper precautions were taken to see that the earthing arrangements were good, and adequate inspection made, there would be very few accidents.

EXTENDED USES OF ELECTRICITY ON BOARD SHIP.[1]—I.

BY JOHN MCLAREN.

The application of electricity on board ship for driving auxiliary machinery has made rapid headway of late years. The time has now arrived for engineers to consider the most economical means of applying electric power for ship works, as at present there is great scope for such.

My proposal is to drive all the auxiliary machinery by the use of electric motors, which will include all cargo winches and hoists, capstans and ventilating machinery, etc., and also to use electricity for the heating of cabins and passages and for cooking. In the engine department, to drive all pumping, refrigerating, lifting machinery and fans by the use of electric motors, and, of course, to use electricity for lighting the ship throughout.

Since my last paper, which was read before the Institute of Marine Engineers, I have had several communications from superintendents and shipowners on the subject; some were good enough to place their ships at my disposal for the purpose of studying the efficiency of the steam auxiliary plant at present in use. It was rather difficult to get at exact figures, but I came to the conclusion that the efficiency of the steam plant was about twenty-five per cent. Owing to the great length of present-day ships and the great increase of auxiliary machinery, the steam has greater distances to travel, with very great loss by radiation. The back pressure of the exhaust steam traveling away to the engine room to get to the winch condenser is very considerable. Several ships had no winch condenser; the exhaust from the winches went up the waste steam pipe up alongside the funnel; the water that gathered at the bottom of the waste steam pipe was carried away by a small drain pipe to a tank, which was pumped out by a donkey feed pump. This would, of course, reduce the efficiency very considerably. I suppose that there was not more than ten per cent to twenty per cent of the water returned to the boiler.

A suction gas installation is one of the cheapest and most efficient forms of power known at the present day, which is suitable for commercial purposes. I am also convinced that it is admirably suitable for auxiliary purposes on board ship, used in conjunction with electricity. I will not say that it would be cheaper on the first cost, horsepower for horsepower, but for equal powers, the working of the plant would show a very considerable reduction in working costs, and in a very short time it would more than pay for any increased capital outlay.

In the system which I propose all these losses, or at least the greater part of them, would be obviated. A moderate estimate of the efficiency of a plant, such as I propose to describe, is eighty per cent; this figure, compared with the efficiency figure for the steam plant, which is, as I mentioned before, a maximum of twenty-five per cent, gives a difference in favor of the suction electrical plant of no less than fifty-five per cent.

In my last paper I was asked what objection I had to the continuous-current motor, which is at present largely used for ship's work; my answer to this is, that it is my object to eliminate all rubbed surfaces, such as brush and commutators, from the exposed motors, which are well known to be a source of trouble and expense. This can be only got over by the use of alternating current for driving the motors, as the induction motor has no commutator proper, and possesses many advantages over the continuous-current motor, chiefly in simplicity and freedom from breakdown.

The size of plant required for driving the auxiliaries on board ship, of course, depends upon the size of the ship and the number of machines required, but for the purpose of this paper I suggest a 300-horsepower unit.

The approximate weight of the producer plant for 300 horsepower would be nineteen long tons, and the space occupied about fourteen feet by ten feet six inches by sixteen feet.

The type of gas engine I would suggest as being the most suitable one for our purpose would be a vertical multiple cylinder, single-acting type, operating on the Otto or four-cycle principle. The speed of the engine should be about 200 revolutions per minute to suit the alternator. A good governor should be fitted. The whole system can be started up in thirty minutes from cold, and from fifteen minutes when standing by, which means under banked fires. A silencer would be fitted to the exhaust pipe.

In a moderate-sized vessel I suggest that alternating currents should be generated at 250 volts and carried direct to the machinery. Such generator should be built upon the flywheel of the gas engine and generate three-phase currents at 250 volts at a periodicity of, say, fifty cycles. In a three-phase generator the armature has three distinct windings which generate three separate currents, the waves of which succeed each other at regular intervals. By connecting the inner ends of these circuits together only three cables are needed to convey this current, but for our purpose I propose to bring out a fourth wire from this point, called the neutral wire, the purpose of which I will explain later on.

The armature of our generator should be of the stationary type with a revolving-field magnet built up on the rim of the gas-engine flywheel. A small direct-current exciter should be coupled direct to the armature shaft. The exciting current is carried to the revolving field of the alternator by means of two small slip rings with metal brushes. It is worthy of note that this is the only electrical rubbing device on the alternator, and it is of such a simple nature that it could give hardly any trouble. The armature would be wound to give three-phase currents and would be star-connected.

In selecting the type of alternator, care should be taken to see that the wave form of the currents is sinusoidal; this would eliminate those heavy potential stresses which are often a source of danger to the windings and power circuits of alternators which have a peaked wave form. This danger is a very serious one in those machines generating high pressures.

The generator should have a liberal factor of safety to enable it to deal with large overloads, should the necessity arise, without danger of breakdown.

The switchboard should be placed in some convenient position in the gas-engine room and would be divided into two distinct sections, one for the power circuits and one for the lighting circuits. The power section would be divided into panels for each power circuit, and from each panel would be led a three-core cable, suitably insulated and armored, to supply current to each distributing center. From this point smaller mains would be taken off to each alternating-current motor in the group controlled from this center.

For the smaller motors I propose to use the induction type of motor, commonly known as the squirrel-cage motor. This type of motor would have no commutator or collecting device of any kind, and would be switched straight on to the mains when starting.

[To be continued.]

[1] Abstract of paper read on September 4, in the Congress Hall, Imperial Exhibition, Shepherd's Bush, London.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

THE ABSOLUTE STANDARD OF LIGHT.

BY JOSEPH H. HART.

Quite recently there has been a series of interesting discussions and suggestions in the various scientific societies and technical journals in regard to the necessity of an absolute standard of light and the difficulties involved in its conception and practical development. The recent suggestion of Dr. C. P. Steinmetz in regard to the use of three mercury lamps providing for a combination of three colors, equally distributed in position in the spectrum, and furnishing an approximate standard for white light, and one capable of easy and absolute measurement and variation, presents essentially the practical viewpoint in regard to the desirability of a standard and is derived from theoretical conditions as well. This conception is worthy of serious consideration, although it practically eliminates as a working condition the physiological effect and any attempt at its measurement or standardization, although the production of light is obviously intended primarily for its utilization as a physiological effect. The fact that a standard is at once available, involving to a certain extent this physiological condition, is seldom, if ever, considered and is due primarily to the fact that conditions which formerly limited its applicability have been largely eliminated or reduced and that even in practical work it presents some special advantages, although its operating conditions are such that it might often require the utilization of a secondary standard, capable of ready comparison, however, with this primary unit.

Reference is made more especially to the utilization of sunlight as a primary standard for lighting measurement. From a physiological, as well as physical, viewpoint, the problem can be considered essentially complicated, due to the following facts: Visible light consists of a practically infinite number of the different wave-lengths in the ether or from an electrical viewpoint can be recorded as a complex combination of alternating wave-forms of a large number of frequencies. The precise effect of each individual wave-length separately and in conjunction with the other types upon the retina of the eye is unknown. Again, the shape, or the wave-form, of the individual alternating frequency is practically unknown and may be different for each individual frequency for best physiological conditions or effects. Thus, the average wave-form in alternating-current work for transformers, induction coils, spark gaps, etc., can be readily determined by means of the oscillograph, but until some such instrument is developed for the recording of frequencies equivalent to that of light, this phase of the problem will always remain unknown.

However, the fact remains that the complexity of different wave-forms and frequencies existing in the radiation from the sun can be recorded as approximately constant under normal conditions, if unaffected by terrestrial phenomena, and are probably best suited for physiological effect upon the eye, since undoubtedly this latter organ was evolved in response to the conditions existing in this form of radiation. While this latter statement may be questoned and the fact assumed that much more efficient conditions in regard to physiological effect may be attained by artificial conditions, in the lack of absolute knowledge in this regard and the total impossibility, under present conditions, of ever obtaining the same, it is reasonable to suppose that the ordinary light source can be regarded as eminently satisfactory from this viewpoint and variations from it undesirable.

Now, white light as obtained from the sun is made up of a large number of combinations of different spectrum colors in small units, and we have no reason to believe that the physiological effect of white light, as made up of the combination of three primary colors in stated proportions, is identical in any respect with that of the natural agent. Under the circumstances it does not seem best to totally disregard the physiological effect and the conditions best suited for this by jumping to a physical standard absolutely, especially when the latter is attained only as the result of considerable complexity of mechanism and the standardization of conditions of production.

Nobody questions the stability of the gravitational standard, and yet this effect may be varying considerably in absolute value, but its stability is generally accepted as unquestioned, and this is so largely on account of its known stability or constancy under all terrestrial conditions. There probably exists no question in regard to the uniformity of the character of the radiation from the sun as existing in empty space in the vicinity of the earth. The fact that this radiation is largely affected on its entrance to terrestrial regions with marked variation due to presence of moisture and other impurities in the atmosphere, temperature conditions, etc., is responsible for its repudiation as a light standard, coupled with the fact that it is not always available, even in altered form, for commercial operations and utilization. Undoubtedly, however, the problems involved in the attaining of some standard form of solar radiation are at least on a parity with those involved in its artificial production, and the conditions involved in its variation with time, when known influencing conditions are practically eliminated, are much less. Above all other considerations the situation of this standard in regard to the physiological conditions involved in the problem is such that it should attain pre-eminence over other competing standards.

The question of wave-form and its variation with the different frequencies would not be so pronounced. The possibility of green light, or the individual mercury-vapor line, existing with a peaked wave-form, and possibly the red wave-length with a flat-topped curve, would not possess significance from a physiological viewpoint, since the existence of conditions in molecular aggregates which would give the multitudinous series of current frequencies common in

natural light would probably be very analogous to that existing in natural conditions for the standard and the possibility of excessive variation in wave-form would be comparatively remote. The use of such a standard would put the difficulties of new radiation and the possibility of inefficiency in optical effect where they belong, since the assumption would obviously exist that individual frequency, such as is often produced in the spectrum line of a given source in artificial conditions, would possess equally anomalous wave-forms and hence present marked limitations in physiological efficiency from this condition as well.

The difficulties of obtaining standard radiation from the solar source are not near as great as those formerly existing. The entire solar spectrum has been mapped from time to time with energy recorders such as the bolometers, or radiation micrometers, based upon thermo-electric or resistance principles with a high degree of delicacy and considerable sensibility. Marked variation exists in the solar spectrum, due to the presence of the atmosphere, the water-vapor in the same in variable amounts, and dust and other impurities in the air. The absorption due to water-vapor could readily be reduced to some kind of standard conditions by the use of a prism of water or water-vapor, for absorption, of variable thickness, the extent of its insertion being determined by a fixed known effect upon an energy recorder in a given absorption line. The variable effect of the atmosphere could be investigated in the same way and approximatly standard conditions reached with a fairly high degree of reliability. The presence of dust and other impurities and temperature variations alone present the important difficulties. The quantity of dust in the atmosphere and the size and amount of this can be determined under some conditions by optical means with a fairly high degree of accuracy, and the variation in the effect on radiation of different amounts of this could be readily studied by means of the various energy recorders or measurers in the different parts of the spectrum.

When it is considered further that the artificial standard generally used possesses a comparatively low illuminating power, that its variation with time and other conditions is quite large, and that the accuracy of comparison with ordinary commercial lamps is also small, the desirability of having a standard of even equal permanence and of considerably higher intrinsic intensity is at once apparent. In the light of modern developments the ordinary candlepower standard, such as the amyl acetate flame, or some other laboratory unit, is obviously too small as a commercial standard for practical purposes. It is somewhat analogous to the measurement of large distances with an inch rule and the utilization of solar radiation at once eliminates this difficulty. Again, when its relation to the physiological factor becomes thoroughly evident the advantages of its utilization become more pronounced. The plea is not made especially for this solar radiation to be used as a device for actual operative conditions. Its development and utilization as an absolute primary standard is dependent only upon conditions and investigations which have scarcely been started as yet in the physical laboratory, but undoubtedly presents possibilities for future development and standardization not present in types capable of development along any of the lines hitherto considered.

Convention of Car-Lighting Engineers.

The next annual meeting of the Association of Car-Lighting Engineers will be held at the Hotel La Salle, Chicago, Ill., on October 4 to 7. A programme of papers of unusual interest will be presented.

Besides the technical matters to be discussed, there will be brought up the question of changing the scope of the association. It has been thought advisable to change the name to "Association of Railway Electrical Engineers," as most of the electrical engineers and chief electricians of the railroads have to do with general railway electrical work and are not confined to car-lighting alone, although at the time of the organization of the association this subject was the one of most engrossing character.

Big Japanese Electrical Manufacturing Company.

Interests in close touch with the Mitsui family, the leading financial persons of Japan, announce that one of the possibilities of the near future is the incorporation of the General Electric Company of this country and the Shibaura Engineering Company, of Tokio, for the joint manufacturing and selling of electrical goods in Japan. The present Japanese demands for electrical machinery amount to about $3,000,000 per year, and this has largely been taken care of by the Shibaura company.

Special Street-Lighting Projects.

Copying the successful establishment of a "White Way" in quite a number of our enterprising American cities, a number of similar projects have been set on foot for several of the prominent streets in other cities that do not wish to be outdone. Among these are the spectacular illumination of Fifth Avenue, New York city; the brilliant lighting of Jersey City streets; special tungsten street lamps in the business district of Dayton, Ohio; additional street lighting in Youngstown, Ohio; flaming-arc lamp installation on the Seventh Street Bridge in Pittsburg, Pa. Most of these projects have been practically completed through the concerted action of adjoining merchants and other property owners, who realize that the cry for "more light" can be turned to good advantage in making an attractive street that will draw the public to inspecting their window displays by night as well as by day.

First Year's Results of the British Patent Act.

According to Consul Horace Lee Washington, of Liverpool, the result of the first year's working of the British patents act has been that $2,500,000 of foreign capital has been introduced into the United Kingdom.

The value of the land and premises acquired by foreign firms which have decided to carry on their manufactures in Great Britain in order to maintain patent rights is estimated at $635,000. The expenditure for buildings was $880,000; plant and machinery, $895,000, making a total of $2,410,000. The annual local assessment on these new enterprises is estimated at $135,692. In addition, it is stated that a great many firms have arranged for English factories to manufacture their patented articles on a royalty basis. A specialist in factory property stated in a recently published interview that his firm was in negotiation with several German and American firms for the acquisition of sites and factories, principally in the chemical, engineering, electrical, and rubber-making trades, and that a French firm of pottery makers is seeking a site for a model village. He estimated that twenty-four firms are already manufacturing in Great Britain as a result of the act.

According to British Consul Thomas Erkine, of Chicago and St. Louis, at least half a dozen Chicago firms have established factories in England.

Convention of the Illuminating Engineering Society.

What will undoubtedly be the largest and from all indications the most successful convention in the history of the Illuminating Engineering Society will be held on September 27, 28 and 29, in the Engineering Societies Building, 25 to 33 West Thirty-ninth Street, New York city. The committee in charge has prepared a very elaborate programme, not only of technical papers but also for the entertainment of the members and guests. It can be safely said that the meeting of the society at the same time as the Hudson-Fulton Celebration offers to non-resident members and guests an opportunity which seldom comes. The arrangements for the entertainments, as well as for the exhibition of historical and most modern lighting appliances, were already described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 11, on page 460.

The programme for the technical sessions as finally prepared, but subject to slight alterations, is as follows:

Monday, September 27, 10:30 a. m.—Address of welcome, T. C. Martin; response, Dr. Louis Bell; president's address, W. H. Gartley; report of committee on nomenclature and standards, Dr. Alexander C. Humphreys, chairman; report of sub-committee on units of flux, Dr. Clayton H. Sharp, chairman.

Monday, 2:30 p. m.—Papers: "The Ethics of Illuminating Engineering," E. L. Elliott; "The Work of Dr. Carl Auer von Welsbach in the Field of Artificial Illumination," George S. Barrows; "The Progress of Illuminating Engineering in Europe," H. Thurston Owens; "Diffusing Mediums," A. J. Marshall; "Facilities at Cornell University for a Study of the Fundamentals of Illuminating Engineering," F. K. Richtmyer.

Tuesday, September 28, 10:30 a. m.—Papers: "The Photometrical Laboratory of the United Gas Improvement Company," Charles O. Bond; "The Physical Laboratory of the National Electric Lamp Association," Dr. Edward P. Hyde; "Notes on Chemical Luminescence of Rare Earths," Dr. Angelo Simonini; "The Light of the Firefly," Drs. H. E. Ives and W. W. Coblentz.

Tuesday, 8:15 p. m.—Lecture: "The Physiological Effects of Radiation," Dr. Charles P. Steinmetz.

Wednesday, September 29, 10:30 a. m.—Papers: "Allowable Amplitudes and Frequencies of Voltage Fluctuations in Incandescent-Lamp Work," Dr. H. E. Ives; "The Principles of Shades and Reflectors," Dr. Louis Bell; "Standard Relations of Light Distribution," A. J. Sweet.

Wednesday, 2:30 p. m.—Papers: "The Problem of Heterochronous Photometry," Preston S. Millar; "Some Results Obtained Through Illuminometry," Norman Macbeth; "Factory Lighting," L. B. Marks; "Operating Efficiencies of Some Commercial Installations of Lighting Systems," A. L. Eustice; "Tests of Moore Tube Installation—New York Post Office," Dr. E. P. Hyde and J. E. Woodwell; "Tests of a Moore Tube," Dr. C. H. Sharp and P. S. Millar.

Arrangements are being completed at the time of this writing for the members of the Chicago Section of the Illuminating Engineering Society, and their friends who wish to attend the convention to leave Chicago on the Michigan Central limited train at 5 p. m. Saturday, September 25, arriving at Niagara Falls (Victoria Park Station) at 6 o'clock next morning. A special stop is to be made at this station and the party will proceed to the new Clifton House. After breakfast a trip via Belt Line to Lewiston has been arranged, returning via Gorge Route to the starting point. After luncheon will come visits to the power plants, Prospect Park and Goat Island. Leaving Niagara Falls at 9:25 p. m., the train is due to arrive at Grand Central Station, New York, 9:03 a. m. Monday.

The stop at Niagara Falls will undoubtedly be enjoyed by all, as well as the trip along the Hudson River early Monday morning. The round-trip fare is $26.85, limited to thirty days for the return. The sleeper rate is $5 from Chicago to New York.

Tickets should be secured from F. E. Deal, city passenger agent, Michigan Central Railway, 236 Clark Street, Chicago. The secretary of the Chicago Section is T. R. Beebe, 155 Michigan Avenue, Chicago.

In New South Wales.

The North Bulli Colliery, New South Wales, Australia, has installed an electric-generating plant and a gas producer to operate it. Electrical development is making good progress here.

Experiments have recently been made in Belgium with wireless in communicating with balloons. The latter recorded signals from the Eiffel Tower with ease.

A CONCRETE CASE OF TUNGSTEN ECONOMY.

BY W. R. BONHAM.

The Park Building, at Pittsburg, Pa., which is fifteen stories high and contains over 400 offices, was until recently lighted by carbon incandescent lamps. Due to the unsatisfactory lighting by these lamps and to the competition of newer and more up-to-date buildings, it was decided to equip the building with tungsten lamps.

The interior decorations of the building were painted a deep sea-green color, which resulted in the general illumination being exceedingly inadequate and of a gloomy, eye-fatiguing nature.

Under the direction of the engineer, the interior was repainted a light buff color, which added to the cheerfulness of the offices and to the efficiency of the lighting.

The general illumination was calculated for an average intensity of light of three foot-candles. The following table,[1] as given by the engineer, shows the lighting in detail for offices and corridors and also a summary for the entire building, both with the old system of carbon lamps and the new installation using tungsten lamps:

	Old System, Carbon Lamps.	New System, Tungsten Lamps.
OFFICES.		
Number of floors	15	15
Brackets (or ceiling outlets) per floor	117	52
Lamps per bracket	2	1
Total lamps for brackets.	3,510	780
Watts per lamp	56	100
Total watts for fixtures	196,560	78,000
Desk lights (approximate).	400	200
Watts per lamp	56	25
Total watts for desk lights.	22,400	5,000
Total watts for offices	218,960	83,000
CORRIDORS.		
Brackets per floor	9	9
Watts per bracket (32-C. P. lamp)	112	40
Total watts for brackets.	15,120	5,400
Elevator domes	15	15
Total watts for elevator domes (eight 16-C. P. lamps for each)	6,720	3,000
ENTIRE BUILDING.		
Watts for offices	218,960	83,000
Watts for corridors	21,840	8,400
Totals watts for building.	240,800	91,400
Watts saved by using tungsten lamps.	240,800	91,400
		149,400

This shows a saving when all of the lights are burning of 149.4 kilowatts. Figuring the current on the basis of two cents per kilowatt-hour and the cost of the lamps on a $1,600 contract in each case, the average life being considered to be 800 hours for both carbon and tungsten lamps, shows a saving of $2.99 per hour for the latter when all of the lamps are burning.

The net saving is shown by the following cost analysis:

COST OF CARBON LAMPS.	
Offices, 3,510 at 16 cents	$561.60
Desks, 400 at 16 cents	64.00
Corridors, 135 at 24 cents	32.40
Elevator domes, 120 at 16 cents	19.20
Total	$677.20

[1] *General Electric Review.*

COST OF TUNGSTEN LAMPS.

Offices, 780 at $1.25	$982.80
Desks, 200 at 61 cents	122.00
Corridors, 135 at 72 cents	97.20
Elevator domes, 120 at 61 cents	73.20
Total	$1,275.20

TOTAL COST FOR 800 HOURS' BURNING.
Current Figured at 2 Cents per Kilowatt-Hour.

Carbon.	
Cost of lamps	$ 677.20
Cost of current	3,852.80
Total	$4,530.00
Tungsten.	
Cost of lamps	$1,275.20
Cost of current	1,462.40
Total	$2,737.60
Net saving in 800 hours by using tungsten instead of carbon	4,530.00 2,737.60
	$1,792.40

Should the current cost 3 cents instead of 2 cents per kilowatt-hour, the savings every 800 hours would be:

149.4 K. W. × 800 hours × 1 cent	$1,195.20 1,792.40
Total	$2,987.60

These data are believed to be conservative. They show very forcibly the economy of using tungsten lamps.

Metal-Filament Lamps in England.

S. L. Pearce, city electrical engineer of Manchester, Eng., publishes the following figures, taken at random from the books of the Manchester Corporation, Electricity Department, showing the saving in electric-light bills effected by the use of metal-filament lamps:

	Cost in 1907.	1908.
Large warehouse, Portland Street	$3,035	$1,600
Public institution, Princess Street	1,650	1,120
Shop, Victoria Street	95	55
Shop (tobacconist), Stretford Road	70	40
Shop (hosier), Stretford Road	85	50
Warehouse, Mosley Street	100	45

Dangers From Electric Shock.

It is practically impossible, says *The Engineering and Mining Journal,* to provide any rule that will determine whether an electric shock will prove of no consequence, or whether the result will be fatal. Much depends on the individual. It is advisable, therefore, to provide so far as practicable, that no shock shall be received at all. Under normal conditions, all voltages above 150 direct current or 125 alternating current, may be dangerous to life. One authority suggests that in order to provide against the failure of any insulating covering, this latter medium in turn should be enclosed in a metallic sheath which is prevented from becoming alive by being permanently and effectively connected to earth.

The first section of the electric funicular railway from Le Fayet to the summit of Mont Blanc was opened to the public on July 25 as far as the Col de Voza (5,495 feet in height). In the morning the first train carried the local French authorities and engineers to the Col, in the quick time of fifty-six minutes.

The Behavior of Litharge Exposed to Atmospheric Agents.

For some years the Siemens & Halske Company, of Berlin, has employed a special paste consisting of litharge and glycerine for fastening large porcelain insulators used in transmission lines to their iron supports. The paste has been extensively used in Italy, and it was found that after a few years many of the insulators cracked without apparent reason. Gino Galla, of the Royal Engineering School, of Rome, has investigated the phenomenon on behalf of an electric installation firm and has ascertained that under suitable conditions of humidity, litharge is capable of slowly absorbing carbonic anhydride from the air and transforming itself into basic carbonate of lead. Examinations of paste prepared at different dates showed that the proportion of carbonic anhydride increased with the lapse of time. In paste put in use three years before, forty-two per cent had been transformed into basic carbonate of lead. Further experiments showed that litharge, when transformed into basic carbonate of lead, increases considerably in volume, and in this fact the cause for the breaking of the insulators must be sought. In the process of transformation molecular forces are developed, which exert a high pressure on the rigid mass of the insulator and cause its breaking. The damage thus caused to a long transmission line may amount to thousands of lire in a year. The trouble can be prevented by protecting the exposed surface of the paste from the influence of atmospheric agents by an impermeable substance or by a suitable varnish.—*Translated and abstracted from L'Elettricista (Rome), August 1.*

Navy Department Supplies.

The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will open bids on the dates given below for the following electrical equipment and supplies. Bidders should without delay make application to the Bureau for copies of the schedules they are interested in, being particularly careful to give the number of each schedule. Copies of the schedules can also be obtained on application to the Navy Pay Office nearest each navy yard.

NAVAL SUPPLIES.

Date of Opening.	Material.	Quantity.	Delivery at Navy Yard.	Schedule No.
October 5, 1909	Magnet wire	1,500 pounds	Puget Sound, Wash.	1671
October 5, 1909	For constructing telephone line between navy yard, Puget Sound, and naval magazine site, Ostrich Bay.	.....	Puget Sound, Wash.	1652
October 5, 1909	Motor-driven lathes	4	Newport, R. I.	1685
October 5, 1909	Motor-driven pumps	2	Washington, D. C.	1683
October 12, 1909	Voltmeters, etc.	Miscellaneous	Mare Island, Cal.	1692

Meeting of Central Electric Accountants' Association.

A conference was held in Indianapolis, September 17, by the members of the Central Electric Accounting Association, President M. W. Glover, of the Ohio Electric Railway, presiding.

The questions discussed at this conference were "The Advantages of Uniform Methods of Accounting" and the "Methods of Computing Car-hours and Car-mileage with Especial Reference to Passenger and Freight Trailer Cars, Non-Revenue Miles, Mileage and Terminal Cities, Blockades and Lost Running Time."

The first subject was discussed by S. C. Rogers, J. D. Maynes and C. E. Thompson. A number of new ideas were brought out and some new methods will be adopted.

The second subject brought out a lengthy discussion participated in by E. D. Gault, L. T. Hixson, E. J. Skehan, Walter Shroyer and M. W. Glover. A committee was appointed to represent the association at the Denver Convention. The next meeting will be held in Dayton, Ohio, December 11.

To Examine Power Company.

At the hearing before the Public Service Commission, Second District, on the application of the Economic Power and Construction Company for authority to continue to supply electricity for light, heat and power purposes, the commission announced that it intended to go into the financial affairs of the company and also its connection with the holding company, the New York Power Securities Company. The former company received a charter from the New York State Legislature of 1893 to enter upon any street or public place without securing the previous consent of the local authorities. Its charter powers were declared unconstitutional by the Court of Appeals in May last, but the company had entered the field at Geneva in June, 1908, and has expended approximately $40,000 on a plant. It now asks the right to proceed, as it has secured a franchise from the Geneva Common Council.

ELECTRICAL Advertising *and* Selling

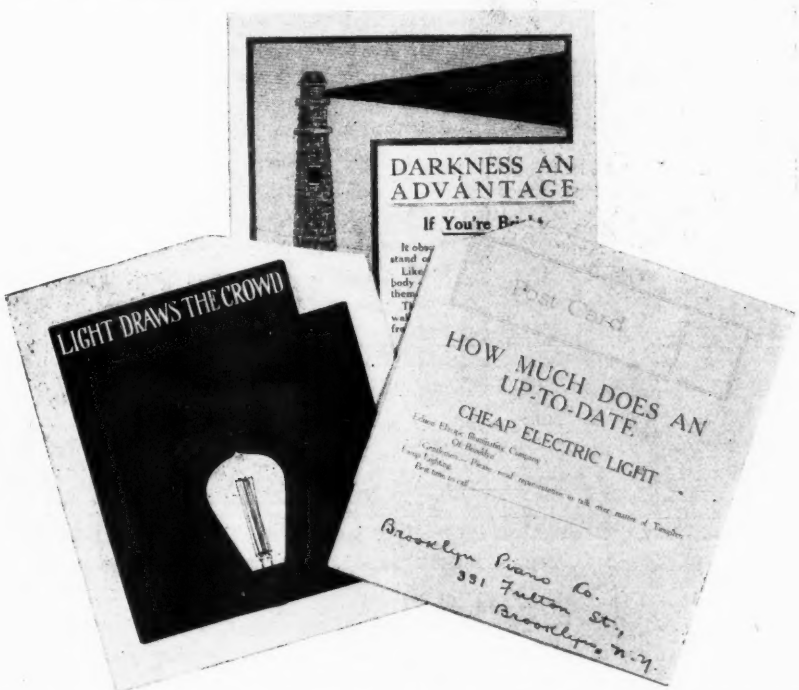
Follow-Up System of Advertising.

The use of electricity has become so much of a necessity, that, in spite of the recent curtailments enforced in the many branches of business, the sales from many cities and districts were little affected. With this evidence of the stability of the industry, and with new experiments demonstrating the limitless possibilities of electricity, it is more than ever incumbent on central stations to exploit the field to the fullest extent, and this can only be done successfully by advertising.

No one would deny that advertising of some sort is essential to every business; the question is, how to advertise.

Advertising and selling go hand in hand. Every salesman sent out by a central station is a walking advertisement. He carries the message to be delivered and spreads it by word of mouth. But the salesman should not work without the use and aid of advertising literature of some description and, to produce the best results, advertising literature should be planned and distributed with the knowledge and co-operation of the salesman in order to increase the effectiveness of both.

Perhaps the most important point in connection with advertising literature, but one which, unfortunately, is rarely given the consideration due it, is what is commonly called the follow-up system. No advertising can reach the highest degree of success unless it is followed up by something to stimulate the interest that it arouses, and turn inquiries into prospects, and prospects into customers.



CARDS USED BY THE BROOKLYN EDISON COMPANY IN A TUNGSTEN STORE-LIGHTING CAMPAIGN. RETURN CARDS ARE PERFORATED FOR CONVENIENCE IN DETACHING.

The mailing of a single piece of advertising may mean a good customer, if, when the spark of interest is started, it is properly followed up.

A piece of advertising literature coming in through the mail is a good deal like a business caller. If the caller is well dressed, has a distinct individuality, and wears the air of being successful, he receives an entirely different reception from the caller who lacks personality, is slovenly in dress, and whose face wears no smile. So it is with advertising. To create the spark of interest it must first make a good impression.

As an example of the follow-up system as applied to central stations, the tungsten lamp, store-lighting campaign of the Edison Electric Illuminating Company, of Brooklyn, N. Y., may here be referred to.

The advertising matter, eight pieces in all, is distinctly impressive. The letters are written on good quality of stationery. The folders, some of which are shown in the accompanying illustration, are all designed so as to at least attract attention on account of the colors and illustrations used.

A return postal is attached in every case and so folded that all that is necessary for the recipient to do is to fill in the time he desires the salesman to call. This is accomplished by so folding that the address of the recipient is written on the back of the postal in such a position as to also serve as a signature. The least amount of trouble caused for returning the postals the more satisfactory are returns.

Testing Advertising.

One of the fairest methods of testing advertising is to assign a definite sum to cover the advertising during a definite period—then allow time, plenty of time for the results to accrue. The sum to be fixed must rest with each individual. This does not mean that he must work it out blindly or in the dark. Advertising is a definite, periodical selling expense and the sooner the retailer realizes this the sooner will his advertising be placed on a sound and proper basis. Every kind of selling expense, whether it be a salesman's wages, office rent, or advertising expenditure, must come out of the gross profit—that is, out of the difference between cost price and selling price.

When the advertiser puts himself in the reader's place, and gives the information he would want in like circumstances, the results are profitable and sure, even if not conspicuous.

It is not the dollar, but the idea behind the dollar that counts in advertising.

CENTRAL-STATION ADVERTISING.[1]

BY J. O. LITTLE.

As time passes and electricity becomes more and more a vital force in the activities of the world, the question of how to advertise becomes a more serious one for the central station to solve. The word how is used designedly, because it is not a question of whether or not to advertise, but of how to advertise.

As advertising and selling go hand in hand, the question then resolves itself into what sort of aid and how much aid your selling force should have.

There is a kind of business known as the mail-order business, which depends entirely upon printed advertising matter and eliminates the salesman. This is the one extreme; the other extreme is to depend upon solicitors or salesmen entirely and eliminate printed advertising matter. The business of the central station is of such a nature that it cannot be conducted most advantageously on either plan to the exclusion of the other. It demands both the solicitor and the printed advertising matter, each as an auxiliary to the other.

There are several different mediums of advertising of which the central station can make advantageous use, notably, newspapers, street cars, direct-mailing, house organs, demonstrations and display rooms.

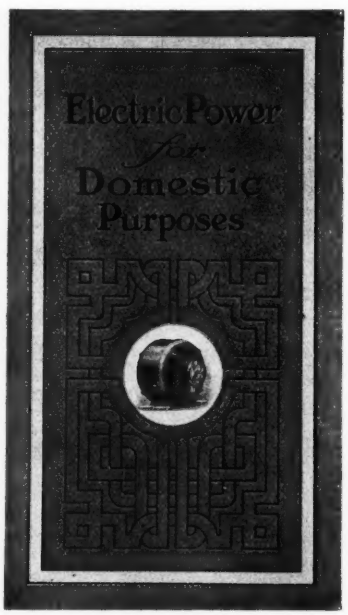
THE DISPLAY ROOM.

Let us consider the display room first. It seems to the writer to be the very foundation of central-station advertising directed toward the introduction of new methods and new apparatus, and the first requisite of the display your own thorough knowledge of what you display. Decide if it is a machine that you consider worth having in your own home, that you feel justified in recommending to your friends and customers. Become enthusiastic about it or send it back to the manufacturer. Never mind the cost. If it happens to be ten dollars more than another machine that you don't consider as good, remember that you are enthusiastic. Enthusiasm on the part of a salesman will overcome a big difference in price. Let your enthusiasm manifest itself when visitors come into the display room, instill it into the solicitors, and make it the feature of your advertising.

People want to see a new device before they buy it, and that is why the display room is important. They also want to see it in operation, therefore everything in the display room should be connected up and ready to put into operation at the turn of the switch. Not to do this is not only poor advertising, but it shows a lack of faith on your part in the economy of electric current.

After the display room is ready, advertise and invite people to come and see it. See to it that they get courteous treatment at the hands of an enthusiastic attendant. Call the visitor's attention to something that she didn't come in to see. A neat booklet to offer her to carry away with her is advertising literature well placed.

The window should by no means be overlooked, for it is exceedingly valuable



AN EXAMPLE OF AN ATTRACTIVE BOOKLET.

advertising space. Since electric current is your specialty, you should use a little of it to make a moving display. People whose thoughts are far away from you and electricity will be attracted by a moving window display, and some of them will have their curiosity or interest aroused to the point of coming in to get a better view or to make inquiries. So simple a moving device as a belt made of toweling, covered with short sentences telling of the motor's good features, running slowly through the feed of a sewing machine, has been known to keep a crowd around the window the most of the time. The moving object catches one's eye, and he stops to look. Another stops to see what he is looking at, and the first thing you know there is a crowd.

It goes without saying that the window should be well lighted and the lights kept burning as long as there is anybody on the streets.

THE NEWSPAPER.

Newspaper space is practically the only space in circulating mediums that appeals strongly to the central station. The newspaper is local and so is the business of the central station. The newspaper is read by the majority of citizens that the central station desires to reach. Moreover, the local press has a great influence upon public opinion, and it is noticeable that newspapers in general, however high their ideals may be, have a tendency to deal more kindly with those who buy advertising space than with those who don't Consequently many central stations look upon it as good business to buy space without serious thought as to how they are going to use it. Whatever the motive for buying it may be, it should be made to carry the best copy procurable. To guard against the necessity of using space that you are not fully prepared to use, it is well to make a contract for so many lines or inches, to be used as desired.

Too much thought cannot be given to the preparation of copy. It should represent the best arguments you have, boiled down to the fewest possible words, and put in such simple language that he who

A GOOD SUGGESTION FOR NEWSPAPER OR STREET-CAR ADVERTISING.

runs may read and understand. It is always better to convey a single thought at a time than to try to say everything at once. The advertisement should be made distinctive in appearance from the other advertisements in the paper. It is a good plan, when a style is once set to adhere to it, so that people may learn to recognize your advertisement; then, if they do not stop to read, the advertisement will still have some value, for it will convey to the reader's mind the thought that you are alive and on the job. The advertisement should have a headline designed to catch the eye, or be illustrated. A strong black-and-white cut is generally more effective than a headline, while a weak cut is less effective.

[1] Abstract of paper read before the sixth annual convention of the Michigan Electric Association, Detroit, August 19.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

AMERICAN TELEPHONE AND TELEGRAPH.

The American Telephone and Telegraph Company (Associated Operating Companies), not including the long-distance lines, reports for the month of July, 1909, and seven months ended June 30, which compares as follows:

July:	1909.	1908.
Gross earnings	$11,385,590	$10,467,923
Operation, maint. and tax.	8,048,521	7,325,111
Net	$ 3,337,069	$ 3,142,812
Interest	529,472	627,156
Available for dividends	$ 2,807,597	$ 2,515,656
January 1 to July 31:	1909.	1908.
Gross	$77,064,384	$71,804,726
Operation, maint. and tax.	56,068,128	51,649,784
Net	$20,996,256	$20,154,942
Interest	3,997,726	4,529,772
Available for dividends	$16,998,530	$15,625,170

RUTLAND RAILWAY, LIGHT AND POWER.

The report of the Rutland Railway, Light and Power Company for the twelve months ended August 31 compares as follows:

	1909.	1908.
Twelve months gross	$252,876	$254,627
Expenses	132,099	138,137
Twelve months net	$120,777	$ 11,639
Charges and taxes	81,396	.....
Twelve months surplus	$ 39,381	.....

EDISON ELECTRIC OF BOSTON.

The annual report of the Edison Electric Illuminating Company of Boston for the year ended June 30, 1909, compares with previous years as follows:

	1909.	1908.
Gross earnings	$4,111,342	$4,229,239
Expenses and taxes	2,766,029	2,690,419
Net earnings	$1,345,313	$1,538,820
Miscellaneous profits	45,360	38,441
Total net earnings	$1,390,673	$1,577,262
Miscellaneous charges	20,797	125,368
Interest	174,905	54,988
Dividends	1,424,389	1,390,796
Deficit	$ 229,418	$ 6,109
Previous surplus	247,219	241,110
Surplus June 30	$ 17,801	$ 247,219

ECONOMY LIGHT AND POWER.

The Economy Light and Power Company, of Joliet, Ill., has issued its report of coming operations for the year ended April 30, 1909, which compares as follows:

	1909.	1908.
Gross	$310,402	$276,881
Operating expenses	138,739	119,892
Net	$171,663	$156,989
Interest charges	65,324	64,145
Surplus	$106,339	$ 92,844

LONDON UNDERGROUND.

The Associated Companies of the London Underground Electric Railways Company report for the month of July, 1909, which compares as follows:

METROPOLITAN DISTRICT RAILWAY COMPANY.

	1909.	1908.
Gross receipts	£54,494	£48,774
Working expenses	26,160	27,897
Net receipts	£28,334	£20,877

BAKER STREET & WATERLOO RAILWAY COMPANY.

Gross receipts	£15,105	£13,890
Working expenses	6,979	6,971
Net receipts	£ 8,126	£ 6,919

GREAT NORTHERN, PICCADILLY & BROMPTON RAILWAY COMPANY.

Gross receipts	£25,899	£24,095
Working expenses	11,532	12,286
Net receipts	£14,367	£11,809

CHARING CROSS, EUSTON & HAMPSTEAD RAILWAY COMPANY.

Gross receipts	£17,992	£15,048
Working expenses	9,936	9,642
Net receipts	£ 8,056	£ 5,406

LONDON UNITED TRAMWAYS, LTD.

Gross receipts	£31,122	£34,689
Working expenses	20,048	19,537
Net receipts	£11,075	£15,152

JUNIATA WATER POWER.

The Juniata Water and Water Power Company has issued a report covering operations for eleven months ended June 30, 1909, as follows:

Sales of current		$ 52,515
Rents and miscellaneous		1,102
Total earnings		$ 53,617
Expense generating, distributing, etc.		35,048
Net earnings		$ 18,569
Deductions:		
Taxes	$ 4,199	
Interest on notes, mortgages, bonds, etc.	60,608	
		64,807
Deficit for 11 months		$ 46,238
Previous deficit		106,181
Deficit, June 30		$152,419

AMERICAN RAILWAYS COMPANY.

The report of the American Railways Company has been issued for the year ended June 30, 1909. The income account compares as follows:

	1909	1908
Gross income subsidiary companies	$2,865,229	$2,927,436
Income from subsidiary companies	468,662	479,029
Miscellaneous income	58,452	19,728
Total income	$ 527,114	$ 498,757
Deductions:		
General expenses	$ 840	$ 976
Interest funded debt	206,323	155,854
Taxes and miscellaneous	10,062	14,814
Total deductions	$ 216,385	$ 171,645
Net income	310,729	327,112
Dividends paid	305,706	305,706
Surplus	$ 5,023	$ 21,406
Previous surplus	499,680	478,274
Total surplus	$ 504,703	$ 499,680
Depreciation adj., etc.	.....	.....
Surplus January 30	$ 504,703	$ 499,680

President J. J. Sullivan remarks upon the operations of the company in part as follows:

"The total number of passengers carried was 67,556,901, showing a decrease of 1,195,685, or 1.74 per cent. The gross earnings of the subsidiary companies were $2,865,229, a decrease of $62,208 as compared with the previous year. After paying all fixed charges, interest and taxes, the net income was $310,729.

"There was paid in dividends to the stockholders of the company $305,706, leaving a balance of $5,023 to be added to surplus account, making a credit of $504,703 to that fund on June 30, 1909.

"During the first five months of the fiscal year, owing to the general depression in business throughout the country, the gross receipts decreased $104,000, but since December, 1908, there has been a gradual improvement in business shown.

"The fire insurance fund has increased during the year $12,426, making the net assets now on hand $181,306; the accident insurance fund has also increased $3,440, making a credit in that fund of $37,166. The average cost of accident claims during the year amounted to 2.22 per cent of gross receipts.

"Collateral trust gold 5's of 1917 amounting to $1,468,000 have been sold to bankers during the year, and out of a portion of the proceeds $865,000 was paid on account of the floating indebtedness, leaving the floating obligations of the company $250,000."

PHILADELPHIA RAPID TRANSIT COMPANY.

At the annual stockholders' meeting of the Philadelphia Rapid Transit Company, held in Philadelphia, the old board of directors was re-elected. The annual report shows gross earnings of $18,317,529, an increase of $17,449, and net earnings of $8,952,792, an increase of $447,220. There was a deficit after fixed charges of $24,270, against $92,049.

Subjoined is the income account for the year ended June 30, 1909:

	1909	1908
Gross	$18,317,529	$18,300,080
Expenses	9,364,737	9,794,508
Net	$ 8,952,792	$ 8,505,572
Other income	480,462	257,422
Total income	$ 9,433,255	$ 8,762,994
Taxes and licenses	1,464,952	1,394,127
Balance	$ 7,968,303	$ 7,368,867
Fixed charges	8,192,572	7,460,916
Deficit	$ 24,270	$ 92,049

ILLINOIS TRACTION.

The Illinois Traction System has made public its earnings for the first part of this year, showing an increase over the preceding six months. Gross income June, 1909, $341,192; June, 1908, $324,272; six months June, 1909, $2,054,218; six months, 1908, $1,913,517. Operating expenses June, 1909, $210,765; June, 1908, $188,258; six months, 1909, $1,218,242; six months, 1908, $1,138,593. Gross income less operating expenses, June, 1909, $130,427; June, 1908, $136,013; six months, 1909, $836,096; six months, 1908, $774,924. Net income, June, 1909, $126,865; June, 1908, $136,885; six months, 1909, $816,753; six months, 1908, $774,924. V.

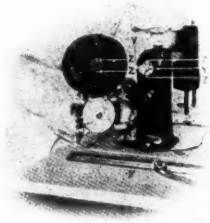
INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

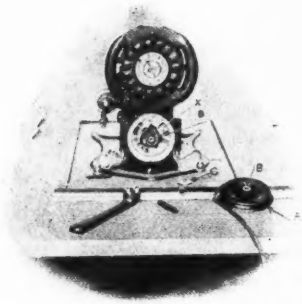
Bissell Sewing-Machine Motors.

In response to a demand for a sewing-machine motor that is adaptable to every type of sewing machine in common use, the Bissell Motor Company, 201-03 St. Clair Building, Toledo, Ohio, has developed sewing-machine motors for both direct-current and alternating-current circuits, which are meeting with general satisfaction and decided approval on the part of central-station companies, which have found it very desirable to exploit them in getting an entering wedge for miscellaneous domestic electric service.

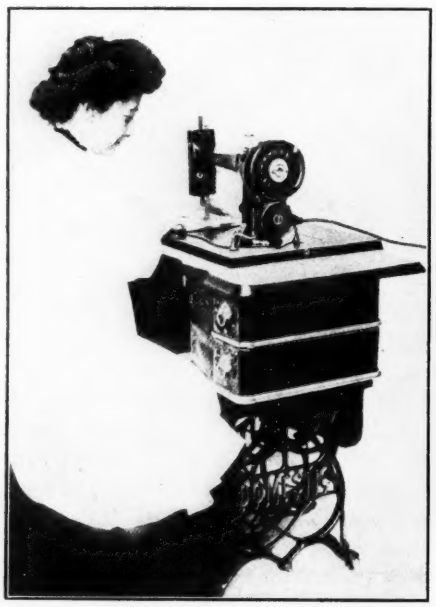
These motors are very compact and are applied directly to the machine itself by removing the hand-wheel and mounting the armature upon the main sewing-machine shaft. The operations of installing the Bissell motors upon the various types of sewing machines are very simple and can be demonstrated by a central-station solicitor quite readily, and with the aid of scarcely any tools. After the hand-wheel is removed from the machine the bobbin-winder is taken off, since each motor is equipped with a bobbin-winder that is attached to it ready for use. The motor is readily slipped into position upon the shaft, as shown in the accompanying illustration, the slots and projections Z and Y of the armature collar fitting into corresponding ones on the end of the shaft. After the motor is locked in place, a leather cord is attached to the treadle of the sewing machine; this cord leads to the rheostat of the controller and enables ready starting and speed control, as well as rapid stopping by means of a set of brakes.



BISSELL MOTOR READY TO BE PUT ON SEWING-MACHINE SHAFT.



SEWING-MACHINE MOTOR. COVER OF CONTROLLER REMOVED.



BISSELL SEWING-MACHINE MOTOR IN USE.

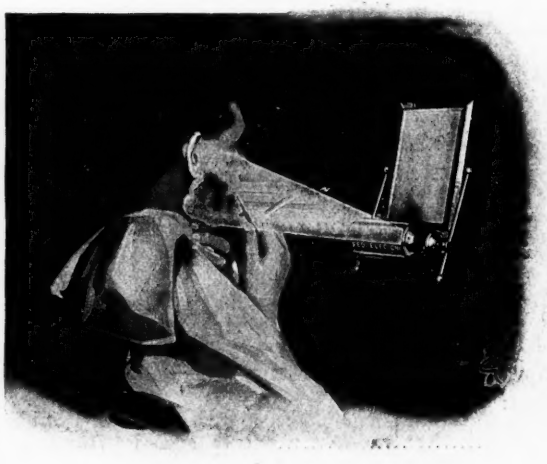
In another view is shown the motor as installed, but with the end covering of the controller removed. The controller is directly below the motor and the pulley A, fitting over its outer face, is the means by which, in connection with the leather cord above referred to, the control is effected. Very little attention is necessary in the operation of these motors, and it is claimed that any housewife can maintain them in perfect order with very little trouble.

The motor can be installed upon any sewing machine without marring it in any way. It can be removed and the machine restored to its original condition. Since the motor is adaptable to any type of machine, the machine itself can easily be changed without requiring another type or size of motor. It is said that solicitors in demonstrating these motors in the home have done so as easily as they could demonstrate the merits of the electric flatiron and in considerably less time.

Electric Shaving and Massage Mirror.

Among the new and useful electrical devices for domestic purposes may be mentioned the electric shaving and massage mirror, which is destined to become popular, particularly with men.

This handy article is a combination of a mirror, electric light and a special reflector. The mirror is six-and-three-quarter inches by nine inches and is mounted in an easel frame with a cylindrical reflector at the base. This reflector is equipped with a tubular incandescent lamp, the rays from which are reflected through a horizontal opening. The reflector is movable and can be adjusted to reflect the light at any desired angle. The mirror is manufactured by the Federal Electric Company, Chicago, Ill.



FEDERAL ELECTRIC SHAVING MIRROR.

Examples of Individual Motor Drive.

Two good examples of individual motor-driven machinery are shown in the accompanying illustrations.

Fig. 1 shows the application of a direct-current Roth motor to a printer's saw. The saw is of the type used by printers for sawing rules and spacers, and is also sometimes used by electrotypers. For ease in removing the saw it will be noticed that there is a square on the shaft and a swinging piece in the shape of a wrench which goes over the square and locks the shaft, while the nut which holds the saw is turned to loosen it and also for tightening the nut in replacing the saw. Upon releasing the swinging piece, it automatically drops out of the way.

The motor is made in two sizes for this work, one being of one horsepower, running at about 3,500 revolutions per minute, and the other, of one-half horsepower, running at the same speed. The motor is entirely enclosed and dust and dirt-proof, and is rigidly connected through the armature shaft to the saw spindle. Both the machines are mounted on a substantial cast-iron base.

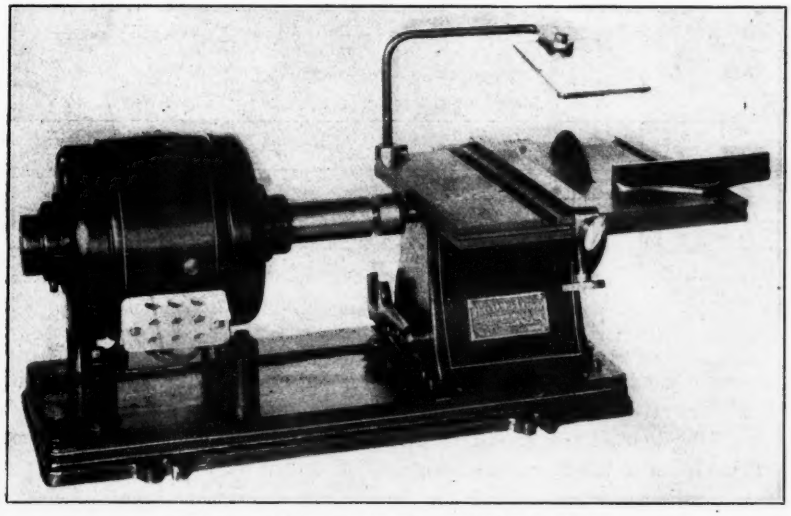


FIG. 1.—MOTOR-DRIVEN PRINTER'S SAW.

A Catlin keyseater, manufactured by the Chattanooga Machinery Company, Chattanooga, Tenn., and having directly connected a Roth adjustable-speed motor, is shown in Fig. 2. The keyseater is of the standard type, excepting that the countershaft has been removed and replaced by a gear wheel, which is driven by a pinion mounted on the motor shaft. The motor is of the interpolar type, is of one-horsepower capacity at any speed varying from about 500 revolutions per minute to 2,500 revolutions per minute, and operates sparklessly at every speed. The speed regulation is obtained through field weakening, and is controlled by a Cutler-Hammer No. 24 starting box. The motor is hung, as from the ceiling, on a bracket extending out from the column of the machine. It was found desirable for the work on which this keyseater is used, to have a device for holding the work while being operated upon. As is shown by the illustration, this holding device was incorporated as a part of and supported by the same bracket which holds the motor.

It is seen from the illustration that the connection is a very compact one, and in its operation the entire outfit has been found to be very satisfactory. The motors for these machines were furnished by Roth Brothers & Company, 1400 West Adams Street, Chicago, Ill.

Steam Turbine in the Textile Industry.

Although steam turbines have been successfully introduced in practically all lines of industry, textile mills were among the first to recognize in them a standard and thoroughly reliable type of prime mover. In New England alone, known everywhere for its many mills, one concern, the Allis-Chalmers Company, has sold thirty-eight steam turbines aggregating in total capacity 51,000 horsepower. The power house of the new Nashawena Mills in New Bedford, will contain two 3,000-kilowatt and one 500-kilowatt steam turbines of their make. The Allis-Chalmers Company has also contracted with the Whitman Mills, at New Bedford, for power-house equipment, including a 2,000-kilowatt steam turbine, and with the Byron-Weston Company, of Dalton, Mass., for one 750-kilowatt steam turbine. The Allis-Chalmers steam turbine is of the horizontal reaction, full annular-flow type.

New Line of Insulated Staples.

A new line of insulated staples has recently been put on the market by James Goldmark, general sales agent of 83 Warren Street, New York. This line should prove of considerable interest to electrical contractors and the electricians who do belt work and interior wiring, as well as telephone companies for all kinds of telephone wiring. One of the advantages the manufacturer claims for this staple is that it is absolutely waterproof and that it also has no break in the insulation beneath the head of the staple, the fiber being put on in such a manner that a double thickness of insulation is insured. Furthermore, the fiber insulation grips around the wire when the staple is driven home into the wood or plaster. These staples are so manufactured that instead of a break at the top of the fiber under the head of the staple, there is a continuous double length, due to the method of folding.

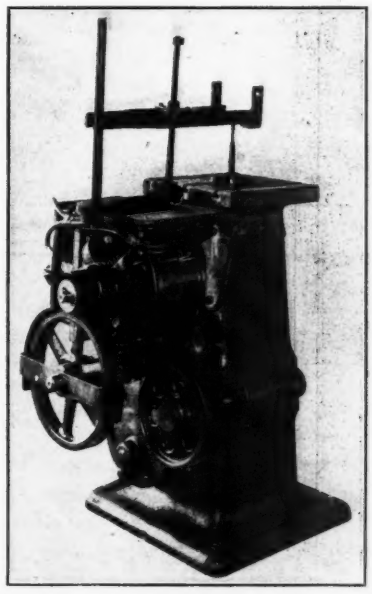


FIG. 2.—MOTOR-DRIVEN KEYSEATER.

This staple is manufactured in various sizes. The saddle of the staple is put on in such a way that it cannot come off.

In June of last year the Canadian Pacific put in operation a telephone circuit between Montreal and Farnham, Quebec, and it proved satisfactory in every way. Since then the company has strung other telephone lines, and in western Canada today it has 531 miles of telephone lines.

The Triumph Electric Company's New Factory at Cincinnati.

About twenty years ago the Triumph Electric Company, of Cincinnati, was organized for the manufacture of electrical apparatus. Beginning in a small way, and when the electrical industry was practically in its infancy, the company has gradually increased in size and importance, until now it ranks as one of the best known of the larger electrical companies. This steady growth is due partly to the fact that it has confined its attention solely to the manufacture of generators and motors and their accessories, the entire time and skill of the engineering department being devoted to perfecting these lines of apparatus.

The move to the new factory marks an era in the history of the company. The new plant will be at least three times the size of the present quarters, and, as may be seen from the accompanying illustrations, is being built in accordance with the most up-to-date practice.

Fig. 1.—Exterior View of Main Building.

Fig. 2.—Interior View of Main Building.

THE TRIUMPH ELECTRIC COMPANY'S NEW FACTORY AT CINCINNATI.

The general factory scheme consists of a main building 800 feet long with three ells at right angles, sixty feet wide, three stories high, and sixty feet apart. About 125,000 square feet of floor surface will be available as soon as the first buildings are erected.

It is the intention of the company to erect the main building, shown in Fig. 1, at the present time; the three ells at right angles to the main building will be erected at an early date. Three other separate buildings, viz., an administration building, blacksmith shop and pattern shop, will also be erected in the near future.

A very good general idea of the factory construction is given in Fig. 2, which shows the main shop nearing completion. It will be noticed that each side bay is provided with a second and a third-floor gallery, each of which is served by two freight elevators. It will be noticed further that the third-floor galleries overhang by a distance of six feet. This construction permits material to be lowered or raised to or from the main floor by the overhead traveling crane. It also allows material to be transferred direct from the third-floor east bay to the third-floor west bay, and, in addition, provides some additional 9,000 square feet of floor surface.

Each gallery is approximately forty feet wide and thirteen feet high, with the exception of the first floor, which is fourteen feet high. All four galleries are supported in the center by twelve-inch box girders in addition to the main columns at the side. The overhanging construction of the third-floor galleries is supported by brackets, as shown in Fig. 2. In addition to the four elevators previously mentioned, access is had to the various galleries by means of stairs, also shown in Fig. 2.

The main floor, between the center columns, is sixty feet wide and is concreted the entire length and width, forming a solid foundation for the heavy machine tools.

The longitudinal I-beams for providing the necessary strength for the galleries are spaced five feet eight-and-one-half inches apart and are six in number. The construction is therefore light and at the same time strong. All floors and galleries are well lighted and ventilated by means of side windows, much care having been exercised in this direction.

As is generally known, the Triumph Electric Company operates in conjunction with the Triumph Ice Machine Company. These two companies, while under one management, are separately staffed and work independently of each other, the west bay being devoted to the manufacture of refrigerating apparatus, while the remainder of the factory is devoted exclusively to electrical machines. Each unit is therefore able to work separately without interference on either side.

The site of this factory comprises some eight-and-one-half acres and is situated in a position which secures for it first-class shipping facilities. The main line of the Baltimore & Ohio Railroad passes directly in front of the property, and switches run into the various buildings, enabling the raw material and finished product to be handled with the minimum amount of labor. The Chicago division of the Pennsylvania Railroad is only half a mile to the north and the tracks of the Norfolk & Western Railroad about the same distance to the west.

The factory has been laid out so that the raw material enters at one end of the building and, after progressing in one direction through the buildings, finally leaves as a finished product at the other end. It will thus be seen that the cost of handling has been reduced to a minimum.

The new factory, as it stands today, without taking into account any future extensions, represents an outlay of approximately a quarter of a million dollars, in addition to which about $50,000 worth of new equipment has been purchased and is now being installed.

The present office building has been laid out in the front end of the east bay, but cannot be seen from accompanying

views. In general, this building has been designed so that each department is in juxtaposition with other departments with which it is most nearly concerned; in addition, a complete telephone system with private exchange enables all departments to communicate with each other readily. Fig. 3 shows the arrangement of the main offices.

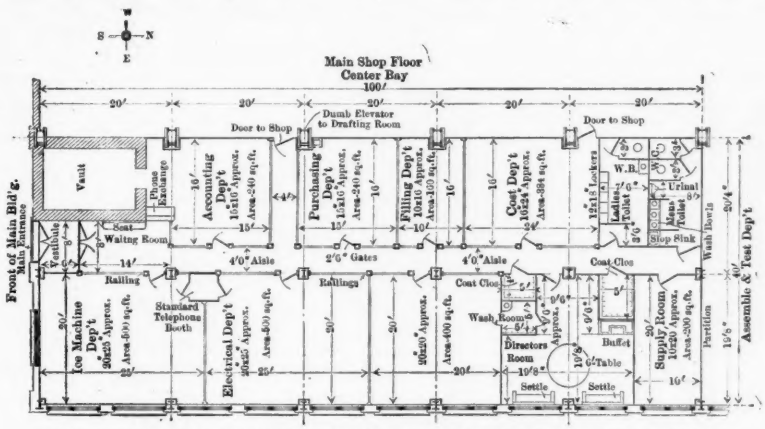


FIG. 3.—ARRANGEMENT OF OFFICES OF NEW TRIUMPH FACTORY, CINCINNATI, OHIO.

FIG. 4.—VIEW IN ENGINE ROOM OF NEW TRIUMPH FACTORY.

In conjunction with three other companies, which are located on adjacent property, a $100,000 power plant has been erected and is now in operation. This plant will supply power, light, heat, water and compressed air to the several factories, and is equipped with Triumph generators of 300 kilowatts capacity. Fig. 4 gives an excellent view of the engine room and shows the generating sets in the background.

The power and light cables are run underground to the point of distribution, as is also the hot water for heating the various buildings, and compressed air at ninety pounds per square inch pressure for driving the pneumatic chipping tools. Every building is equipped with automatic sprinklers, water at 100 pounds pressure being supplied for this purpose.

The Triumph Electric Company controls branch offices in practically all the large cities of America and Canada and has obtained an enviable reputation for turning out only high-grade machines.

The new factory is the outcome of twenty years' successful operation, in which quality has been the prevalent motive throughout. The company is optimistically looking forward to an exceptionally good year and, with the added facilities obtained in the new factory, will be in better position than ever to turn out high-grade work.

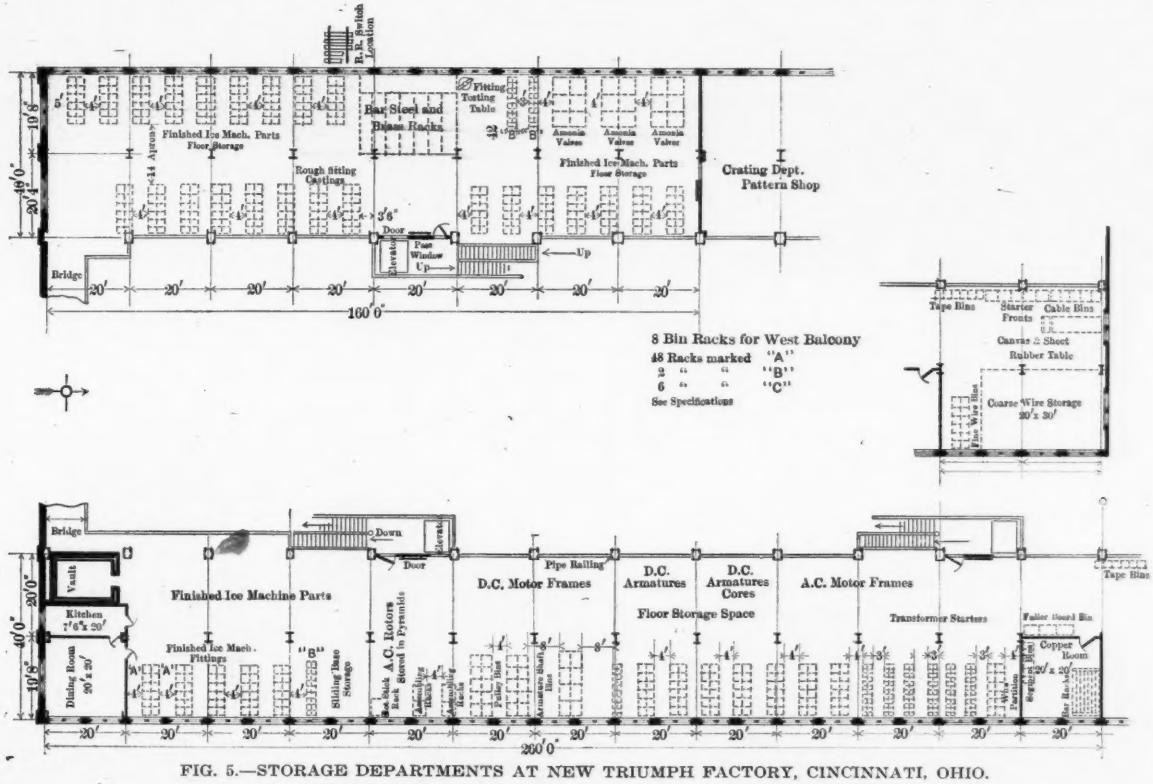
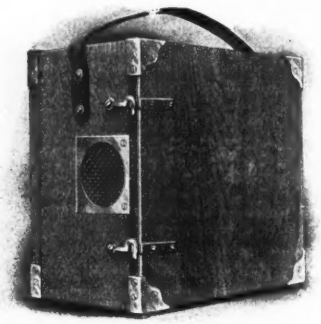


FIG. 5.—STORAGE DEPARTMENTS AT NEW TRIUMPH FACTORY, CINCINNATI, OHIO.

Fig. 5 shows the arrangement of the stores, which are located on the second-floor gallery, immediately above the punch department and directly underneath the armature-winding department, thus re-

Composite Telephones Provide Additional Facilities.

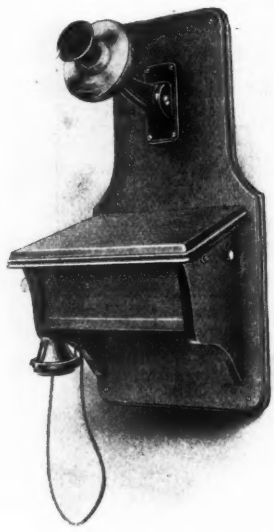
The Cleveland, Akron & Columbus Railroad Company has recently installed a composite telephone circuit on its lines between Akron and Columbus, Ohio, a distance of 130 miles. The line is constructed of No. 9 copper wire, and has three intermediate telegraph offices between the terminal telephones. There



WESTERN ELECTRIC PORTABLE COMPOSITE TELEPHONE.

are also three intermediate telephone stations connected to the line.

In connection with this service the above company has equipped its wrecking train with a portable composite telephone, which may be connected to the line at any point along the road, thus enabling it to obtain direct connection with headquarters at all times. In addition to this, an extra portable composite telephone is kept at the division headquarters, to be



WESTERN ELECTRIC COMPOSITE TELEPHONE.

used on inspection trips or in cases of emergency.

The Western Electric Company's No. 1312-A composite telephones are used in the stations, and its No. 1314-A portable set is used on the wrecking train. These sets are shown in the illustrations. It is reported that first-class service is obtained with this equipment.

It will be readily seen that the above system enables additional service to be obtained at a very small cost, as an existing telegraph wire may be used for this service without interfering with the operation of the telegraph service.

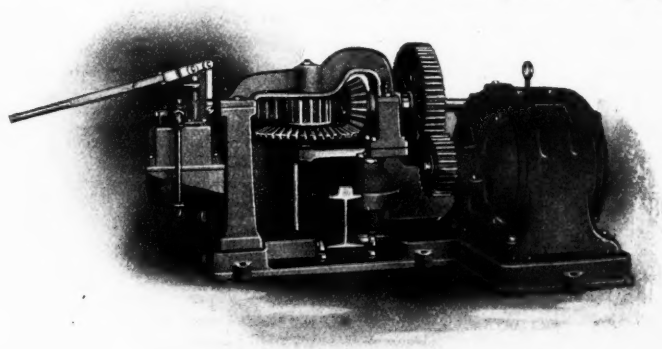
An Electrically Driven Rail Bender.

The Smith patent motor-driven rail bender, illustrated herewith, is a convenient device, manufactured by the Watson-Stillman Company, New York, N. Y., which is a great advance on the purely hydraulic machines made by the same firm.

The framework of the machine is a heavy steel casting made in one piece, the solidity of which insures regularity of curvature and rapidity of work, which, with the small amount of manual labor required, renders the tool an almost indispensable one on construction work. The power-driven bending roll is mounted in a frame which is driven forward to give the desired curvature by a hydraulic cylinder, the power for which is a small hand pump mounted on the frame of the tool above the cylinder. The roll can be driven out under a pressure of fifty tons. The two fixed-roll centers are thirty-four inches apart. The driving roll is geared to make one turn to eight turns of the pulleys, which are twenty-four inches in diameter and have a seven-inch face. The bending rolls must be made to suit each shape of rail to be bent.

The outer bending rolls are changed by loosening set screws and pulling out the pins. The arm holding the middle bending roll can be worked in and out by the lever shown at the left without the aid of the pump, if the release valve is open, so that the pump is necessary only when bending a rail to get the desired curvature.

The capacity of the machine is about one medium-length rail per minute when once adjusted.



THE SMITH MOTOR-DRIVEN RAIL BENDER.

Some Westinghouse Contracts for Japan.

At Yokkaichi, Japan, the electric-light company has installed a 750-kilowatt Westinghouse turbo-alternator in its Miye Ken plant. The turbine is to operate at 200 pounds steam pressure, exhausting into a vacuum of twenty-seven inches. Three-phase, sixty-cycle current at 2,200 volts, for lighting and power purposes, will be supplied by the new generators, supplanting the old reciprocating-engine-driven equipment, which is to be taken out. Three fifty-five-horsepower Westinghouse gas engines have been installed by the Furawaka Coke Works, of Tokio, to operate its coal-washing plant. These engines will use as fuel the sulphur gas derived from the coke ovens, having an average calorific value of 460 British thermal units per cubic foot. This new equipment is additional to a pair of eleven-by-twelve-inch two-cylinder Westinghouse gas engines driving a Westinghouse 125-volt direct-current generator.

Lumber Cars Run by Electricity.

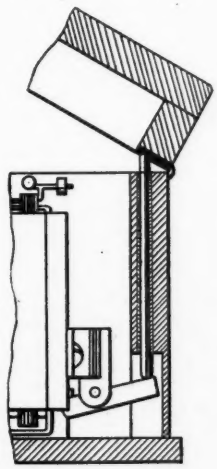
Among the many excellent features of the mill plant of the Goodman Lumber Company at Goodman, Wis., is one of the finest electric-light plants ever installed in a mill plant in that part of the state. The plant not only lights the mill and mill building, but also lights the town of Goodman and will eventually furnish power for propelling the cars loaded with lumber which are hauled from the mill plant to the lumber yards, where the lumber is piled.

The lumber as cut is all loaded on cars and hauled to the yards on regular car tracks.

A New Galvanometer Protecting Device.

Those accustomed to the use of a portable testing instrument in which a moving system on pivoted points is an integral part, have no doubt frequently been troubled in finding the indications inaccurate or finding a great loss of sensibility through either the pivots or the jewels becoming damaged by rough handling.

With a view to entirely eliminating such trouble and maintaining the system of their instruments free and sensitive, Queen & Company, of Philadelphia, Pa., have devised an automatic clamp for their delicate suspensions whereby, when the lid of the containing case is closed, the moving element is lifted entirely free from contact with the pivot point and jewels, but as the cover is opened the system automatically returns to its initial position, thereby maintaining its initial sensibility and retaining the pivots and jewels uninjured, regardless of the mechanical treatment to which it is in the meantime subjected.



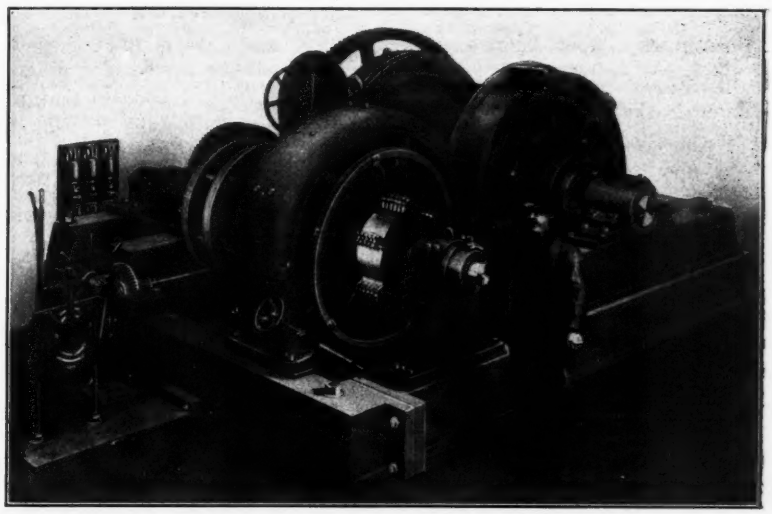
NEW GALVANOMETER PROTECTING DEVICE.

It has heretofore been the custom to clamp magnetic systems and even moving coil systems when supported by one jewel by simply lifting the systems off its one jewel, but in such instances it is comparatively a simple matter, while in the case where the moving system is supported at both ends upon a jewel and pivot the matter becomes much more complicated, as in trying to lift the coil away from one jewel more pressure would consequently be put on the other support, and it therefore becomes necessary, in order to make a satisfactory clamping device, to move either one or both jewels or pivots. This company has accomplished by an ingenious arrangement, a moving jewel-clamping lever shown in the accompanying illustration. The use of this clamp will effectually prevent any injury to the pivots or jewels of the moving system during transportation, and the user may be assured that the initial sensibility of the galvanometer is constantly retained. The mechanical arrangement is such that it can be applied to many existing types of galvanometers of Queen & Company's manufacture.

This device will be greatly appreciated by all testers who are familiar with the difficulties met with, while doing outside commercial testing, where one has to carry the instrument about continually, and where they must be ready at all times to make rapid and accurate tests.

Large Electric Mining Hoist.

There was recently installed in the mine of the Washington Coal and Coke Company, at Dawson, Pa., a large mine hoist with an electric motor which presents several features of considerable interest.



LARGE ELECTRIC MINING HOIST.

The hoist is used to haul thirty-five mine cars, averaging 3,800 pounds each when loaded, up a maximum grade of eight-and-one-half per cent, 8,000 feet long at a speed of 600 feet per minute. The loaded cars start at the bottom of the slope on a four per cent grade, which gradually increases till the maximum grade is reached near the top, where the loaded cars are pulled in on a landing on a grade of about six per cent and on a curve of 150-foot radius. The empty cars will be allowed to drift down the slope by gravity controlled by a brake on the hoist drum.

The hoisting drum is six feet in diameter and five feet wide between flanges. It is fitted with a hand brake on one end and a hand operated friction clutch on the other end. The drum is of very heavy steel construction, with a twelve-inch shaft. All the gears on the machine are cast steel with machine-cut teeth, the main spur gear being ten-inch face and the motor gears thirteen-inch face.

The frame is made in sections for convenience in installing in the mine. The drum and large gears and the friction clutch parts are also made in two pieces for the same purpose.

The hoist is driven through a flexible coupling by a 500-horsepower, direct-current, non-reversing, compound-wound Westinghouse motor. It is controlled by a standard semi-automatic Westinghouse magnetically-controlled unit switch controller. These switches are operated from the controller shown in the illustration, the controller carrying only small currents while the main motor current is handled by the magnetically-operated switches, thus doing away with the difficulties from arcing.

This controller has an accelerating relay which prevents the starting switches from closing too rapidly and thereby prevents too large starting currents. Thus the second switch cannot close until the current allowed to flow by the closing of the circuit has fallen to a predetermined value. As soon as this value is reached the second switch closes, thereby short-circuiting a resistance section and the current rises, but the third switch cannot close until the current has again fallen to the predetermined value. This not only prevents injury to the motor from careless handling during acceleration, but

also insures the most rapid starting possible.

The controller also has a safety relay which opens the resistance switches in cases of excessive overload, and thereby protects the motor while running. If this relay operates while the motor is running, the motor does not stop, but is automatically brought up to its full speed again. This is a particularly valuable feature in an installation of this kind where the cars may strike some obstruction, as it affords perfect protection to the apparatus.

When it is remembered that this hoist is installed some 800 feet below the surface of the ground, the advantages of the electric transmission of power are evident. In no other way could this large amount of power be transmitted as economically nor as easily.

The hoist was supplied by the Connellsville Manufacturing and Mine Supply Company.

What Constitutes a Good Lubricant?

If one had to make his choice between a lubricant which kept the bearings cool and one which lasted well, the wise machinery user would select the former. The saving of a gallon or a pound a day would be dearly bought if the bearings ran so hot that they had to be constantly watched. Even the difference of a few degrees would mean appreciably greater friction, and friction cannot exist without wear.

What property of a lubricant keeps the bearing cool? Simply one thing—a low coefficient of friction. Assuming always that there is a sufficient film between the surfaces to "float" the shaft, it only remains that the characteristics tending to resist the relative movement of the surfaces (*i. e.*, reduce friction) be a minimum. If the friction is small, the heat engendered will likewise be small.

But this elementary statement of the matter assumes certain conditions and ignores others. What is to insure maintaining a sufficient film? How is the lubricant to be supplied to the bearing? When supplied in sufficient quantities, will it stay in the bearing, or does it tend to shirk its work by leaking away?

So far as the coefficient of friction is concerned, there is no better lubricant for moderate pressures than a clean oil. Its origin—animal, vegetable or mineral—does not matter much if it has the proper body and is fresh. In time, however, animal and vegetable oils tend to undergo chemical changes. In a word, they thicken, gum or turn rancid. Mineral oil is not subject to these changes, and is therefore usually preferred. But oil, however good, is useful only for moderate pressures.

The limitations of oil have led to the introduction of numerous greases. For the most part these have been made of animal fats, which are solid below blood heat, and above that temperature are equivalent to thin oil. Greases of this character have been fed semi-automatically by virtue of this property of softening under heat. It is evident that if, with a good lubricant, a certain bearing might run at eighty degrees, it suffers by being required to heat up to 100 degrees before it can receive the lubricant. Such a bearing is automatically starved and its life materially shortened. On the other hand, melted grease stays in the bearing no better than oil. It leaks away and must be constantly replaced by a fresh supply.

These characteristics are inherent in animal greases. An attempt is made to mitigate them by introducing fillers of various sorts, to give body to the grease. These substances, if solid in character, such as graphite, soapstone, etc., tend to remain in the bearing while the fatty constituents melt and run away. A further objection to animal fats is that they turn rancid and corrode the surfaces that they are supposed to lubricate. This drawback is especially serious with ball and roller bearings, the efficiency of which depends on the maintaining of the original high polish and true alinement of the bearing surfaces.

Where shall we find a lubricant which both offers a low and constant coefficient of friction and does not tend to leave the bearing before it has done its work? It is on this aspect of the problem that pure mineral grease is now receiving so much attention. Its coefficient of friction, whether it be high or low, is fairly constant, for the reason that the grease is not affected by ordinary changes in temperature. If a given grade is suitable for the lubrication of the given machinery in summer, it is also suitable in winter, and there is no tendency to turn liquid under ordinary loads.

Pure mineral grease possesses likewise the much-desired clinging quality which oil lacks. Since it does not soften, it cannot be fed like animal grease. If stiff it must be forced into the bearing under pressure, and this pressure, when properly regulated, will force out the spent grease, which otherwise would stay in the bearing indefinitely. The economy of mineral grease resolves itself, therefore, almost entirely into the question of coefficient of friction. If the coefficient of friction is small, the grease will not be spent rapidly, because the bearing will run cool.

Several different processes are used in making mineral grease, and the results obtained with them are correspondingly diverse. The purer the grease, the more nearly it approaches oil as regards coefficient of friction, while it maintains its advantage over oil in tending naturally to stay in the bearing, as well as in its ability to carry much higher loads.

In some recent tests made at Cornell University, under the direction of Prof. R. C. Carpenter, a sample of what is known as No. 1 Density Keystone Grease showed a coefficient of friction of 0.015 under loads from 150 to 300 pounds per square inch, thus equaling the coefficient of engine oil under loads of eighty pounds per square inch. Under heavy loads the oil friction rapidly rose. A slightly heavier grade, No. 1 Density, showed a coefficient of friction of 0.02 under 258 pounds, and slightly less than that under higher loads up to 500 pounds, which extraordinary pressure the sample carried during a run of one hour. These results, which were duplicated by no other lubricant (and tests were made at the same time of animal and other well-known mineral greases), are taken by the makers of Keystone Grease to justify their claims for exceptional economy and high lubricating quality.

High-Speed Monorailway Projected.

From an authoritative source comes the announcement that a monorailway will shortly be built by the American Monorail Company through Pelham Park to City Island, New York. This system was shown in operation at the recent Jamestown Exposition, and engineers of the Public Service Commission predict, it is said, a speed of 135 miles an hour under favorable conditions. The idea has also been mooted to build an upper deck over the present elevated railroads in New York city for monorail express trains, should the Pelham Park and City Island service prove acceptable to the traveling public.

Whether this would be practicable from an engineering standpoint, or whether the increased noise would be acceptable to the adjacent residents, is very much of a debatable question.

Current Electrical News

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, SEPTEMBER 12.—Upon the new section of the Metropolitan subway which passes under the Seine near Notre Dame there has been carried out an extensive piece of work in connection with the underground shore stations and the caisson tunnel under the river, this being the congelation of the soil at the bank of the Seine. At this point there is an underground branch of the Orleans railroad running along under the embankment, and the new subway line had to cross below the railroad line. Congelation was the only method which would allow of running the subway tunnel without disturbing the railroad tracks, and an extensive freezing plant was erected near the shore at Place St. Michel. The work has now been entirely finished and the plant is at present dismounted.

At Roubaix there is to be held the international exposition of northern France, during 1911. The exposition is to be laid out on a large scale, and mechanical and electrical industries will be among the leading features. It is organized by the municipality of Roubaix, with the concourse of the Chamber of Commerce and the patronage of the government. This locality is one of the principal industrial centers of the northern region.

In Belgium there is being developed a power-distribution project, and it will cover a wide region in which the smaller industries are abundant, this being the northern Brabant region. The power lines will supply the centers of Bois-le-Duc, Ruremonde and others.

Among the new electric tramways which are to be built in Austro-Hungary I may mention the line running from Csorbato to Barlangliet. It is expected to have the line open for traffic by next year, and it will carry a large amount of tourist traffic passing in the region of the Tatra mountains. Another project is the increase of the electric traction lines of Miskolcz, and there is a new line to be run to the suburb of Heocsaba.

At Arcachon, France, there is building a large electric plant by the Gas and Electric Company. It will supply current for lighting as well as for the tramway system. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, SEPTEMBER 18.—The Ontario government will construct an electric railway from Charlton to Elk Lake, in the silver mining district, a distance of twenty-two miles. It will cost $750,000 to put a road into Elk Lake and $3,000,000 to continue it to Gow Ganda. The ground has been examined by engineers.

Manager Saunders, of the Bank of Montreal in Mexico, who is now here, makes the announcement that no rain has fallen in the Necaxa Valley and that the Mexican Light and Power Company has been paying at the rate of $10,000 (Mexican) per day for coal.

At the annual meeting of the Quebec Railway, Light & Power Company the report of the directors showed that the company had paid a dividend of two per cent on the common stock last year, which was the first dividend paid for several years. The company's service will be improved and the road outside the city will be developed.

The Ontario government has granted a charter of incorporation to the Electric Smelting and Power Company, with an authorized capital of $4,000,000. This company is incorporated with wide powers. It is empowered to own and operate mines, deal in metals, build and operate railway and steamship lines, to act as a holding company, to produce, accommodate and dispose of electrical energy or other energy, and to construct and operate telephone and telegraph lines.

A wireless telegraph system, to parallel the lines of the present telegraph companies throughout Canada, is the project planned by the Lepel Wireless Company, which has asked the city of Hamilton, Ont., and practically every municipality in Western Ontario, to install plants at a cost of $2,500 each. No money is to be paid until the system has been in operation for thirty days. The company promises a rate of one cent a word for messages of twenty-five words and half a cent per word for all words over that number.

The work on the substations of the Mines Power Company at Cobalt and Kerr Lake is making good progress. Along the right-of-way the poles are strung from Matabitchouan to Cobalt. The buildings being erected at Cobalt will be the terminus of the main transmission line and will receive two of the four compressor units, giving a capacity of 10,000 feet of free air a minute from the station. One thousand men are now working on the company's plant.

As the result of a recent meeting of the directors of the Ottawa & Morrisburg Electric Railway Company, grading on the new line will be commenced at once. A total mileage of fifty-five miles will be covered at a cost of $770,000.

The mica industry, which has been practically dead in this vicinity for some time, is now again active. Orders have been received from France, England, Germany and other European countries, as well as from many firms in the United States. The mica miners in Canada depend largely on the market offered in the United States, and as the Payne tariff bill has lowered the duty on mica, the decrease, although small, will be profitable to the Canadian producers of mica.

At the recent meeting of the Canadian Independent Telephone Association in Toronto it was shown that there were now 27,000 independent telephones in operation in the Dominion. In Alberta and Manitoba, where the Bell equipment was purchased by the provincial governments over a year ago, the mileage and number of telephones have increased very rapidly under government ownership and operation. In view of the reports to the effect that the Bell Telephone Company is making strenuous efforts to induce independent companies to enter into agreement for the interchange of service, it was resolved that in future "no member of the association shall enter into any arrangement or reversal of any agreement having for its object the interchange of service over the lines of the Bell company." As the work of the independent companies in this country is becoming more and more of a national character, the association resolved to call upon the provincial legislatures to at once introduce legislation that will bring about the provincial ownership of all long-distance telephone lines. J. B. Ware, general secretary of the International Independent Telephone Association, pointed out that, in 1895, there were only about 245,000 telephones in the United States, but as a result of competition, there were at present more than 6,000,000 telephones there, Canada, he declared, was fortunate in having a spirit of public ownership, which was frowned upon by municipal officers and governments in the United States. W.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

ALBANY SOUTHERN CHARTERED—The Albany Southern Railroad Company, which has been incorporated at Albany, N. Y., with the secretary of state, is a reorganization of the Albany & Hudson Railroad, the third-rail electric line between Albany and Hudson, which went into a receiver's hands some months ago and was sold under mortgage foreclosure early this month. New Yorkers are the owners of the controlling interest in the property. The new company has a capital of $3,475,000, of which $2,100,000 is preferred and $1,375,000 common stock. The company's principal office is in Rensselaer, N. Y. The directors are: W. R. Gross, R. A. C. Smith, Charles H. Werner, A. M. Young, Irvin W. Day, L. B. Grant, G. M. Congdon, of New York; C. L. Rossiter, of Brooklyn; Myron T. Herrick, of Cleveland, Ohio.

CONCENTRATION IN OREGON—The Willamette Valley Company has deeded to the Northwestern Corporation all its property in Oregon, including electric-lighting plants in Albany, Corvallis, Eugene, Springfield, Dalles, Monmouth and Independence, including also water systems at Albany, Springfield and Independence and a gas plant at Eugene. The Northwestern Corporation has in turn filed a mortgage to the Germantown Trust Company, of Philadelphia, for $5,000,000, secured by all the above-mentioned property, and, in addition, the electric street-railway system, of Walla Walla, Wash., the interurban electric line between Walla Walla and Milton, Ore., a power plant in Umatilla County, Oregon, which supplies current to Walla Walla, Wash., and Pendleton, Ore., electric light and gas plants at Walla Walla and Pendleton, and gas plants at North Yakima, Wash., and Lewiston, Idaho.

LIGHTING AND POWER.

(Special Correspondence.)

GRAND RAPIDS, MINN.—The city will call for bids on 40 4-light lamp posts. C.

TALOGA, OKLA.—This city has voted bonds to establish its own electric-light plant.

GREENE, IOWA—The local light and power company is expending $10,000 in improvements to the plant, including an addi-

tion to the power house in which three waterwheels, aggregating 200 horsepower, will be installed. C.

WATERTOWN, S. D.—Ferris Bros. are planning to rebuild the light plant at this point.

CRESCENT, OKLA.—This city has voted bonds for $30,000 to construct its electric-light plant.

GURDON, ARK.—The Ohio Stave and Timber Company is about to put in an electric-light plant.

LIBERAL, MO.—The Liberal Rolled Feed Mill and Elevator Company will install an electric plant here.

LAGRANDE, ORE.—The electors have voted in favor of issuing bonds for the erection of an electric-lighting plant.

ANOKA, MINN.—This city is to make extensive improvements is its lighting plant. Nicholas Moberg can give information.

WESTVILLE, OKLA.—The Westville Electric Light and Power Company has been incorporated with a capital stock of $10,000.

UNION, ORE.—The special election to act on the matter of issuing electric-lighting bonds to the amount of $25,000 resulted favorably.

CENTERVILLE, IOWA—The Centerville Light and Traction Company has let the contracts for the Centerville-Mystic Interurban line.

CENTRAL CITY, NEB.—C. F. Newmyer, city clerk, will receive bids until noon, September 27, for the erection of an electric light building. C.

SHULLSBURG, WIS.—An electric light plant has been contemplated here, although a franchise for the same has not yet been granted.

OLYMPIA, WASH.—The Tonino Light, Power and Water Company of this place is preparing to put in a dam on the Skookumchuck River for power purposes.

SEATTLE, WASH.—The Stone & Webster Engineering Company is erecting a six-story reinforced concrete building, 60x120, at Seventh Avenue and Olive Street. C.

CHISHOLM, MINN.—The Range Power Company has arranged for the erection of a brick building, 26x78, and ordered a 400-horsepower, 4-cylinder Riverside engine. C.

CHIHUAHUA, MEX.—The Nazas River Power Company has announced plans for the erection of a hydroelectric power plant in the Fernandez Canyon on the Nazas River in Durango.

ABERDEEN, S. D.—The Aberdeen Light and Power Company is making additions to its engine and dynamo equipment and switchboard. The company will install twenty additional cluster lights and thirty more large arcs. C.

SAN DIEGO, CAL.—The Edwards Wave Motor Company has let contracts to the National Iron Works of this place for machinery for six power-producing units for the company's proposed wave motor plant at La Jolla, near this city.

METHOW, WASH.—The Methow Irrigation and Power Company has begun construction work on its power plant on the Methow River six miles from Winthrop. The plant will utilize the entire volume of the river at a 140-foot fall.

REDDING, CAL.—Water has been turned on at the recently-completed power plant of the Northern California Power Company at Manton. This plant has a capacity of 5,000 horsepower, bringing the company's total up to 15,500 horsepower.

FRESNO, CAL.—A. G. Wishon, of the San Joaquin Light and Power Company, states that the company will extend its power lines to Coalinga and establish a power-distributing system at that place, at a cost of approximately one million dollars.

ODESSA, WASH.—The town council has granted the Washington Water Power Company an electric-lighting franchise in this city. The line will connect with the Harrington-Sprague power line, about twenty miles from this city. About $500,000 will be spent on the work.

GRAND FORKS, N. D.—The Electric Construction Company, of St. Paul, Minn., having declined to enter into a contract to install the new lighting system of the city unless the warrants to be issued in payment for the same are guaranteed, the city will proceed with the work itself. C.

ASTORIA, ORE.—The Hammond Lumber Company is about to erect an electric power plant on its property at the Tongue to supply light, heat and power at a cost of from $75,000 to $90,000. From this plant will be derived the current to be distributed by the Astoria Electric Company.

FRESNO, CAL.—H. J. Darling, of Reno, Nev., has appropriated 40,000 inches of water for power purposes from Big Creek in this county and 20,000 inches from Pitman Creek, also in this county. It is understood that a power plant is to be erected near the junction of the two creeks.

SANTA BARBARA, CAL.—The Merchants' Mutual Light and Power Company has been incorporated here with a capital stock of $1,000,000. The incorporators are: C. H. Frink, W. R. H. Weldon, John F. Diehl, S. M. Kennedy, R. H. Ballard, William Dieterie, Herbert F. Keenan, L. J. Lee and H. J. Bauer.

MILES CITY, MONT.—The Buffalo Rapids Power Company has been incorporated here by George Burt and others with a capital stock of $300,000. The company plans to divert water from the Yellowstone River and develop electricity to supply the towns along the Yellowstone from Billings to Glendive. A dam will be put in the Yellowstone at a cost of about $25,000.

MONTEREY, CAL.—W. H. P. Hill, manager of the Monterey County Gas and Electric Company, says that his company will run a power line to Salinas for the purpose of supplying that city from the Monterey plant, where modern machinery with 3,000-horsepower capacity has just been installed. The company's plant at Salinas will be put in good condition and held in reserve.

SAN FRANCISCO, CAL.—The Pacific Gas and Electric Company has contracted with the trustees of Reclamation District No. 548 to furnish power to the district to operate pumping plants for a period of ten years for $30,000. Three 100-horsepower centrifugal pumps and two 350-kilowatt transformers will be installed. The district to be kept clear of seepage and overflow water contains 15,000 acres.

SHAMOKIN, PA.—The new hoisting apparatus at the counter slope of the Greenough colliery, which has been in course of construction for the past few months, was started last week and gives splendid satisfaction. The hoisting is all done by electricity, all the power being obtained from the colliery's own electric plant. The apparatus is able to handle four cars with two tons in each at one time. The work of installing it was done by a Scranton contractor.

LANSING, MICH.—Three more power companies, with a total capitalization of $700,000, have filed articles of incorporation here. They are the Little Muskegon Water Power Company, capital $125,000; Montcalm Electrical Company, capital $75,000, and the Western Hydro-Electrical Company, capital $500,000, all at Grand Rapids, Mich. It is the general belief that there is some connection between these three companies and the large group of power companies that filed articles last week.

ESCANABA, MICH.—All of the property of the Escanaba Street Railway Company has been taken over by the Escanaba Traction Company, in which stock is held by the leading business men of this city. The new company, in addition to conducting the two older companies, will build an interurban line connecting Escanaba and Gladstone, Mich., and two giant power dams on the Escanaba River. As soon as arrangements can be made the company will also build a huge paper pulp manufacturing plant on the river.

COLUMBIA, PA.—Francis T. Homer, treasurer of the Susquehanna Power Company, states that within six months the financing of the company will be resumed, with a view to building a dam and power plant on the Susquehanna River and selling the current in Maryland. Capital stock to the amount of $400,000 has been issued, and Mr. Homer said he was assured the substantial interests behind the enterprise would soon give it the additional financial backing to enable it to begin work on the dam and plant.

LYNNFIELD CENTRE, MASS.—At a hearing in the Town Hall at Lynnfield Centre it was announced that an agreement had been reached between the New England Telephone and Telegraph Company and the Reading Electric Light Company providing for joint ownership of all electric light and telephone poles in Lynnfield. The citizens have been opposed to marring the streets with two lines of poles. The work has been started and in the course of six weeks wires will be strung to private residences and public buildings.

JEWETT CITY, CONN.—Work is to be commenced on the new Hopeville dam for the Ashland Cotton Company. The dam will be situated on the Pachaug River, practically in the same situation as the old one, and will be seventeen feet high and have a rollway of eighty feet. An electric plant is also to be constructed at the dam, with a direct drive from the waterwheels, and is expected to furnish at least 400 horsepower, which will be used for lighting the Hopeville plant and to run electric motors to be installed in the works.

GOUVERNEUR, N. Y.—About 150 men are employed in building a massive concrete dam at South Edwards on the Oswegatchie River. This dam when completed will be one of the biggest engineering feats undertaken in St. Lawrence County since the building of the Massena Power Canal. The dam will be sixty-two feet in height. The base will be fifty-two feet in thickness, tapering to twelve feet at the top, and will be built of solid concrete. It is estimated that about 3,000 horsepower will

be developed, which will be used to generate electricity to operate the mills of the Diana Paper Company, a few miles away. The surplus power will probably be taken to Carthage and used for operating the mills there.

ST. CATHARINES, ONT.—A new electric-power company has come into existence in this district. It is known as the Ridgeville Electric Light and Power Company, Limited, and is capitalized at $40,000. The object is to supply electric light and power to places in the townships of Thorold, Pelham and Gainsboro. A franchise has already been obtained in the two townships first named. Behind the company are Geo. Arnold, Ridgeville; Hugh A. Rose and Frank W. Houston, Welland; J. C. Stoat, Fenwick, and H. S. Arnold, Toronto.

BAKERSFIELD, CAL.—General Manager J. F. Stratton, of the West Side Electric Company, which was recently granted extensive transmission line franchises on the west side of this county, has gone to Maricopa to supervise the construction of the company's proposed steam-electric generating plant. The company's initial installation will be of 450 horsepower. The machinery for this plant was ordered some time ago from the Western Gas Engine Company. Machinery to develop 900 horsepower additional has now been ordered.

WESTFIELD, MASS.—The selectmen have awarded the contract for the enlargement of the municipal power plant to the Westinghouse Machine Company. The figures of the successful bidder were $24,322.75. The vote to enlarge the local plant was passed at the spring town meeting and since then the selectmen, with Town Clerk C. N. Oakes and George Pettibone, manager of the power plant, have been investigating the different power plants in New England to determine which will best suit the local needs. Work will be started at once.

SAN DIEGO, CAL.—The San Diego Consolidated Gas and Electric Company has just installed one of the largest engines ever brought to the Coast. It has a capacity of 1,250 kilowatts and weighs 175 tons, swinging a flywheel eighteen feet in diameter and weighing, in all, seventy-five tons. The engine is of the cross-compound condensing type. The cylinders are fifty-four inches in diameter and have a stroke of forty-eight inches. It is directly connected to a 1,250-kilowatt generator. The engine was installed by the Allis-Chalmers Company.

HUMBOLDT, TENN.—Foundations have been built at the power house for the new dynamo recently purchased, and the new machinery is expected to arrive within the next ten or fifteen days. The new dynamo is a 100-kilowatt machine, similar in type to the large dynamo recently installed. When this dynamo is put in commission Humboldt will have one of the best and most modern electric plants of any town of like size in the entire South. All the electric machinery and equipment is of the most improved and economical pattern.

WATERVILLE, ME.—The Messalonskee Electric Company, of Waterville, will soon ask for bids for the construction of a new power house, which will be erected on the Messalonskee stream at a point known as Rice's Rips. The site for the new proposed power house will be at a point where the water has a very swift current. The dam will be about twenty feet in height and will be of reinforced concrete. The power house will be of brick and located on the south side of the stream. The source of the water supply is the large Messalonskee Lake.

ROCK HILL, S. C.—The entire holdings, franchise and other properties of the Rock Hill Water, Light and Power Company were sold at auction, in pursuance to announcement following a receivership, on August 31, by P. A. Wilcox, receiver, of Florence, S. C. The price paid was $80,000 by Martin Maloney, a capitalist of Philadelphia, his being the only bid put in, he being a stockholder in the company. The liabilities of the concern are said to have been about $102,000, including bonded debt, etc. The plant will be renovated and put in up-to-date shape by the new owner of the same. L.

SAN BERNARDINO, CAL.—The San Bernardino Valley Gas Company has taken over the Lytle Creek Power Company's plant here, involving a payment of $125,000. The purchasing corporation was recently organized by Los Angeles and Pasadena capitalists and has bought up the independent gas companies here and at Redlands and Colton. The deal, while not taken to mean that the gas combine will enter the electrical field, is interpreted to point to a possible arrangement between the gas trust and the Pacific Light and Power Company for its gas works here, though local interests deny this.

STANWOOD, CAL.—It is understood in Stanwood that the Pacific Gas and Electric Company plans to begin work again upon its plant at that place. A short time ago a large block of the company's bonds running into the millions was placed with New York capital. In the neighborhood of $150,000 was spent at Stanwood before the work upon the plant was ordered stopped. The project provides for impounding the waters of French Creek, diverting these waters through a short tunnel, and turning them back into the creek again at a point much below the intake of the tunnel.

ELECTRIC RAILWAYS.

(Special Correspondence.)

SAN DIEGO, CAL.—The City Council is advertising for sale an electric-railway line on K, R and Twenty-fifth streets.

MARSHALLTOWN, IOWA—The Iowa Electric Railroad Company proposes to build an electric road to Grundy Center and one to Ames; also to extend the street railway to the city park. C.

CENTERVILLE, IOWA—D. C. Campbell, T. P. Shonts and others have sold the Centerville Light and Traction Company to D. C. Bradley and F. S. Payne. C.

BELLINGHAM, WASH.—The Whatcom Railway and Light Company has begun work on the Happy Valley extension of its Harris Avenue line and will have it completed by October 1.

LOS ANGELES, CAL.—The Pacific Electric Company is preparing to extend its electric-railway line from La Habra eastward a distance of twelve miles. The same company is surveying for a line in the San Dimas Wash.

ALBANY, N. Y.—The Long Island Electric Railway Company has filed a certificate with the Secretary of State, announcing that the amount of its capital has been reduced from $2,100,000 to $600,000, consisting of shares of $100 each.

GETTYSBURG, PA.—The Borough Council has given the Hanover & McSherrystown Street Railway Company a franchise to enter the town at its eastern boundary and run a single track road on Hanover and York streets sixty feet into Centre Square.

NEW YORK, N. Y.—Leslie Sutherland, receiver of the Yonkers Railroad Company, says that he is about to spend $100,000 on the roadbed and tracks of the company. He is also going to install twenty pay-as-you-enter cars in a few weeks, and will take up the question later of having all the closed cars of the company equipped in this manner.

CAMBRIDGE, O.—The Cambridge Power, Light and Traction Company, owning and operating the city street car system, the interurban lines to Byesville, the street and commercial lighting system of Cambridge and a large ice manufacturing plant, has transferred its entire holdings to the Midland Power and Traction Company in consideration of $250,000.

GOSHEN, IND.—H. J. Heinze, the pickle manufacturer, has taken over the control of the Winona Interurban Railway Company, connecting Warsaw and Goshen, a distance of twenty-five miles. The reorganized company has just elected the following officers: President, H. J. Heinze; vice-president and manager, C. O. Johnson; secretary, H. C. Anderson.

TRENTON, N. J.—In the United States Circuit Court, Judge Rellstab took under advisement the appointment of Judge John G. Horner, of Mount Holly, as receiver of the Burlington County Railroad Company. Application for the receivership was made by the estate of Josiah K. Bougher, of Philadelphia, claiming that since the construction of the road in 1904 it has not paid. The company is bonded for $475,000.

NEW CASTLE, IND.—Work is progressing rapidly on the Indianapolis, New Castle & Toledo traction line and material of all kinds is being distributed along the line. The Carnegie Steel Company secured the contract for eighteen miles of sixty-pound rails, which will be laid as rapidly as it arrives. The electrical apparatus and equipment is being installed in the power house and there is little doubt of the completion of the road in a few months. S.

PORT ARTHUR, TEX.—The charter of the Port Arthur Street Railway Company has been granted and H. J. Meyers, J. H. Reeder, A. B. Davis, Joe Galrea and S. M. Krohn were elected directors. J. H. Meyers has been elected president; S. M. Krohn, vice-president; J. H. Reeder, secretary and treasurer; A. B. Davis and Joe Galrea, local counsel, and Judge Dale, general counsel. The engineer of the company, H. E. Talbott, will begin the surveys at once.

WALLA WALLA, WASH.—Articles of incorporation have been filed in the office of the county auditor by the Spokane, Walla Walla and Western Railway Company, the company capitalized at $3,000,000. Seven trustees were named to act until the second Monday in January, 1910, and they are: E. M. Symonds, Spokane; M. S. Parker, Spokane; W. L. Russell, Walla Walla; M. R. Hanger, Dayton; G. S. Hynes and E. C. Muxson, Spokane. The object of this new company is to construct and operate steam, gasoline and electric railways, connecting this city with adjacent towns, and also to construct and operate lighting plants in the states of Washington, Idaho, and Oregon.

GUTHRIE, OKLA.—Within a few weeks' time grading will begin at Dalhart on the Mountain Valley & Plains Railroad, through the Panhandle country, according to Del W. Harrington, president of the company. All profiles, surveys and estimates have been completed and work will be pushed toward Dalhart from Cimarron, N. M., a town 170 miles northwest. A construction company has been organized to do the building. There

has never been any doubt about the road building from Cimarron, N. M., to Guthrie, according to President Harrington. The company is chartered under the laws of Texas, Oklahoma and New Mexico, and has an executive office in each of these states.

ATTICA, IND.—Articles of incorporation have been filed for a new electric road from Kankakee to Kewanee. This road connects Danville and Urbana with a large territory in Illinois and will increase the desirability of having a connecting line that will join Danville and Lafayette by way of Attica along the Wabash road. The filling of this forty-five-mile gap is becoming more probable every day and connections like the one mentioned are a great help to it.

INDIANAPOLIS, IND.—The Indiana Railroad Commission has ordered all the traction roads in the state to cut away the weeds, brush and trees at highway crossings. The Commission asserts that numerous fatal accidents are occasioned by reason of an obstructed view at highway crossings. The State Board of Tax Commissioners has issued a statement relative to the assessment value of property in the state. The grand total of the assessed value of electric roads is $21,536,041. S.

SOUTH BEND, IND.—It is persistently rumored that if experiments now being conducted prove successful, the Vandalia Railroad will be changed into an electric line between this city, Logansport and Terre Haute. A trip of inspection was made over the line recently by the officers of the line, accompanied by expert electric engineers, and it is known the officials are seriously considering electrification. Interurban competition is said to be the most potent reason for converting the line into an electric road. S.

SHEBOYGAN, WIS.—The Elkhart line, in which the Brickhausers, of Elkhart, are the heaviest stockholders, has practically completed arrangements where by the Sheboygan Light, Power and Railway Company will operate that line, giving through service from this city to the summer resort. The work of building the line through Plymouth to connect with the Sheboygan Light, Power and Railway Company is under way, and it is expected that the line will be completed so as to be utilized this year.

INDIANAPOLIS, IND.—Articles of incorporation have been filed with the secretary of state of the South Bend and Logansport Traction Company, which proposes to build a line between those points. The road is planned to pass through Lakeville, Plymouth, Rochester and Fulton, and will be seventy miles in length. The directors for the first year are Thomas P. Moredock, Virginius Nicar, Patrick J. Houlihan, Henry F. Coleman and David Pepper, Jr. The stock is $400,000, with preferred shares to the sum of $200,000.

ASHEVILLE, N. C.—The progress of the Asheville & East Tennessee Railroad Company, which recently began in a modest way, as the Asheville-Weaverville electric line, about ten miles in length, is now said to be assured of backing ample to push the line on to connect with the new Clinchfield Railway from West Virginia to the Atlantic coast, tapping the railroad probably in Yancey County. The electric railway has just received additional rolling stock enabling it to operate passenger, express and freight service to and from Weaverville, with the aforesaid promise to finally reach the Clinchfield Railroad.

SOUTH BEND, IND.—The South Bend & Logansport Traction Company, incorporated to build an electric line that will ultimately extend to Indianapolis, received a franchise to operate in Marshall County recently. The company promised to have actual construction under way by June 1, 1910, and electric trains in operation by June 1, 1911. The South Bend & Logansport is a reorganization of the old Indianapolis, Logansport & South Bend Company, formed several years ago. The new company includes Samuel R. Perly and T. P. Moreder, South Bend capitalists, but is backed by Philadelphia financiers, it is stated.

MOLINE, ILL.—At a meeting of the directors of the Davenport & Manchester Interurban Company, held last week in Davenport, Iowa, arrangements were made to call a meeting of the stockholders October 5 to reorganize the company, which practically means that the road will be commenced shortly. Fred W. Rank, of Moline, is secretary of the organization, and says that the capital stock will be increased to between $500,000 and $600,000, and that it will take approximately $2,000,000 to construct the road. The road is ninety-one miles long, but twenty-seven miles of it will be constructed first, between Manchester and Monticello.

EUREKA, CAL.—Fifteen of the wealthiest men in Humboldt County, representing $8,000,000 in capital, gathered in this city recently to discuss plans for the building of an electric railroad to connect Eureka with Redding, in the Sacramento Valley. The meeting resulted in the appointment of a committee of ten, headed by William S. Clark, president of the Humboldt Gas and Electric Company, and E. E. Skinner, a prominent lumberman, as secretary, to arrange the preliminary steps necessary for the organization of a company that will immediately undertake the construction of the line. The route of the proposed road is over 100 miles long.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

MEXIA, TEX.—The Mexia Telephone Company has been incorporated with a capital stock of $12,000.

LANGDON, N. D.—Work has been commenced on the construction of a telephone line to Waterloo. C.

HALLAM, NEB.—The Farmers' Telephone Company has been incorporated with a capital stock of $25,000.

LONG PRAIRIE, MINN.—The Northwestern Telephone Company is considering improvements to the local system. C.

ONTARIO, ORE.—J. A. Lackey will erect a two-story brick building for the Ontario Independent Telephone Company. C.

TYLERTOWN, MISS.—The Cumberland Telephone Company, main office Nashville, Tenn., is arranging to establish telephone system.

PETALUMA, CAL.—The Lakeville Telephone Company has awarded a contract for the construction of an eleven-mile line to W. D. Thomas.

DALLAS, TEX.—The Dallas Independent Telephone Company will erect telephone building; three stories and basement; fireproof, to cost $40,000.

OROVILLE, CAL.—The Pacific Telephone and Telegraph Company is planning to spend $11,000 in rewiring the city and in laying an underground cable.

CARNEGIE, OKLA.—The Spring Valley Rural Telephone Company has been incorporated by Charles Lunsford, S. A. Van Cleve, H. Kindbale and others.

RIPLEY, TENN.—The Lightfoot Telephone Company has been incorporated with $4,000 capital stock by J. H. Coughlan, W. H. Foust, W. F. Roberson and others.

DES MOINES, IOWA—The Iowa Telephone Company will erect new exchanges for handling the business of the consolidated Iowa and Mutual Companies' business. C.

ABERDEEN, S. D.—The stockholders of the Dakota Central Telephone Company authorized the expenditure of $300,000 for improvements and extensions during 1910. C.

SMITHVILLE, TENN.—The Smithville Home Telephone Company has been incorporated with $3,000 capital stock by T. W. Wade, J. H. Christian, W. H. Davis and others.

ST. LOUIS, MO.—The Home Co-Operative Telephone Company has been incorporated by John R. Gay, Truman B. Barnes, both of Maplewood, Mo.; F. A. O'Connor, St. Louis, and others.

COLEMAN, TEX.—The West Texas Telephone Company will, it is reported, expend $16,000 for improvements. It will install new cables, 800-box flashlight switchboard and make other improvements.

AMARILLO, TEX.—The Oldham Telephone and Telegraph Company, C. C. Tabor, president, 323 Taylor Street, will construct a telephone line and locate plants in and extend lines to Wildorado, Vega and Adrian, Tex.

NEW YORK, N. Y.—The Hudson Valley Telegraph Company has been incorporated to construct a telephone and telegraph line with a capital of $25,000. The incorporators are E. J. Kelly, J. Streppone and J. Foy, New York city.

REDDINGTON, IND.—The Reddington Township Mutual Telephone Company has been organized and incorporated to build and equip a telephone plant at Reddington and extend the lines throughout Jackson, Jennings and Bartholomew counties. S.

RICHMOND, VA.—The Sandy Valley Telephone Company of Grundy has been incorporated: John A. Looney, president, Grundy, Va.; Bart Belcher, vice-president, Artia, Va.; R. E. Ellswick, secretary and treasurer, Mouth Card, Ky. Capital, maximum, $4,000; minimum, $1,000.

AMARILLO, TEX.—C. C. Tabor, of this city, is promoting a telephone company to build a line connecting Amarillo and Wildorado, a distance of twenty miles. Mr. Tabor is engaged in business in Amarillo and Wildorado, and is exercising himself in this matter responsive to a popular demand for the service. With the completion of the proposed line into Wildorado it is expected people there will take it up and make an extension into Tucumcari, thus covering a long stretch of country with which no telephonic communication is had at this time.

TOLEDO, OHIO—Toledo is again the scene of a bitter telephone war for the control of the local business. Following the long-distance war between the Bell and Independents, precipitated by the announcement some time ago of sharp cuts in rates in this section, comes a second announcement of a struggle for the local business. The fight, it is claimed, was started by the Bell Telephone Company this month, when it sent its solicitors out with instructions to place Bell telephones with all exclusive Home Telephone users, absolutely free of charge. The plan is said to be to grant free Bell telephones indefinitely to all users until

everyone is supplied who uses a telephone of any kind. The Bell company has recently expended about $500,000 in substations and other ways, adding two new exchanges with a capacity of 9,000 telephones each. It is said that the company is prepared to spend more than $100,000 to furnish its subscribers a complete list of telephone patrons. H.

TROY, ALA.—The Southern Bell Telephone and Telegraph Company, main office Atlanta, Ga., will expend about $22,000 for installation of entire new system; will install new wire, apparatus, switchboards, all appurtenances at the exchange and new telephones in dwellings and business houses; construction has been started; T. F. Powell, local manager.

FAYETTEVILLE, W. VA.—A telephone company has been organized at Clear Creek for the purpose of constructing and operating a telephone line between Clear Creek and Lawson. The line will be ten miles long and will extend through Artie and Colcord. The promoters of the enterprise are prominent business and professional men of that section of the county which the telephone is calculated to serve.

DES MOINES, IOWA—New exchanges for the handling of the consolidated Iowa and Mutual Telephone companies' business probably will be installed in Des Moines as the result of a conference between G. E. McFarland, the general manager, and C. E. Yost, president of the Iowa Telephone Company, held at Omaha recently. If the new exchanges are built, the general offices of the Bell company probably will be moved from Omaha to Des Moines.

WASHINGTON, D. C.—The complete telephone dispatching system in use on the Pittsburg & Butler Street Railway Company line from this city has proved such a success that it is being adopted by other lines elsewhere in the country. Manager W. H. Pape, of the Short Line, has stated that there have recently been several parties of operating officials from other interurban lines called to inspect the Butler Short Line dispatching system, with a view to adopting it. Many steam lines are making extensive use of the telephone system in conjunction with the telegraph.

WASHINGTON, PA.—Workmen for the National Telephone Company have completed the new line from the Canonsburg Exchange to Thomas Station, where an exchange has been opened for the convenience of the people in that section of the country. The building of the line was most bitterly contested by several farmers over whose land it was built, and during the six weeks which were required to construct the new line, three bonds had to be given by the National company. A number of injunctions were also issued against the company, and still other farmers went so far as to cut the wires after they had been strung. The line was put in operation yesterday.

DETROIT, MICH.—Extensive improvements and additions are to be made to the Michigan State Telephone Company's system, involving an immediate expenditure of $150,000 for the betterment of the service. "Our growth in business this year is outstripping the gain in subscribers of last year, which we thought was a record breaker," says President Kingsbury. "The improvements will relieve our east office district, which is congested. It will also greatly improve our service in and around Fairview and Grosse Pointe. This will allow our Grosse Pointe subscribers to have individual lines at reasonable rates, instead of party lines, as at present. The initial expenditures for this one section involve a new building, switchboard, underground conduit and cables, and will cost about $150,000, perhaps more."

NEW MANUFACTURING COMPANIES.

(Special Correspondence.)

TABLE ROCK, NEB.—The Table Rock Electric Company has been incorporated with a capital stock of $25,000.

BINGHAMTON, N. Y.—The Diamond Electric Company of this city has been incorporated to manufacture electric devices and appliances. Capital, $100,000. Incorporators: S. J. Hirschmann, J. Schwab, H. C. Price, Binghamton.

CHICAGO, ILL.—The Nohe Electric Renovator Company has been chartered to manufacture electrical devices. The capital stock is $25,000, and G. Langhenry, A. W. Nohe and J. V. Crane are the incorporators.

MUNCIE, IND.—The Warner Manufacturing Company has filed articles of incorporation with the secretary of state. The capital stock is $250,000. The object of the corporation is to build, establish, equip and operate a plant to manufacture automobiles, automobile parts, engines, motors, electrical goods and apparatus, and to do a general manufacturing business along these lines. Thomas W. Warner, N. M. Warner and E. Staunton Janney, incorporators. S.

TOLEDO, OHIO—The Ohio Electric Company has been incorporated at Toledo by Henry P. Dodge, Rathbus Fuller, Henry E. Marvin, James Brown Bell and Robert R. Lee. Capital stock, $75,000. The company will take over the business of the Ohio Electric Carriage Company, incorporated some time ago to manufacture electric automobiles. H.

ELECTRICAL SECURITIES.

Progress was made in the bull campaign last week with affairs still looking up on Monday of the present week. There was evident, however, an appearance of strain in upholding the top prices, and it is quite likely that there will be some retrogression. Industrials report continued improvement, and fruit and cereals are still announced as in a very promising condition.

The large earnings which were a feature of Philadelphia Rapid Transit's operations in the first two months of the current fiscal year have continued up to date. For first nineteen days of September gross receipts are $70,500 ahead of the corresponding period of last year.

At the annual meeting of the American Railways Company, held in New York city, the annual report was approved and directors re-elected. At a meeting of the directors the present officers were re-elected.

At the annual meeting of the stockholders of the Union Traction Company, held in Philadelphia, Pa., the annual report was read and approved and the old board of directors was re-elected.

At the annual meeting of the Tri-City Railway and Light Company, held Thursday at Hartford, Conn., Arthur Coppell, of Maitland, Coppell & Co., was elected a director to succeed Clarence McCuaig of Montreal. The other directors were re-elected. Directors of the Tri-City Railway and Light Company have re-elected the present officers for the ensuing year. An interest prominently identified with the Tri-City Railway and Light Company says that the earnings of the company, which were at the rate of $1,500,000 when the consolidation of the companies was made, have risen to $2,000,000 per annum, and the earnings for August were at the rate of $2,100,000. This company has taken a prominent share in the revival of business, as is shown by the fact that while other concerns ran behind in earnings during the depression, the Tri-City increased earnings thirty-three per cent. The company is now beginning to show results of the $4,000,000 spent in improvements since 1905.

According to an interest in the Brooklyn Rapid Transit Company, its gross returns for seventy-five days since July 1, when the new fiscal year began, have been between $5,000 and $6,000 a day in excess of earnings for the corresponding period a year ago.

DIVIDENDS.

American Cities Railway and Light Company; regular quarterly dividend of one-and-one-half per cent on the preferred stock, payable October 1.

Bell Telephone Company, of Canada; regular quarterly dividend of two per cent, payable October 15 to stock of record September 25.

Chicago City Railway Company; regular quarterly dividend of one-and-one-half per cent; payable September 30 to stock of record September 20.

Duluth Edison Company, of Duluth, Minn.; quarterly dividend of one-and-one-half per cent on the preferred stock, payable October 1 to stock of record September 21.

Electric Boat Company; regular quarterly dividend of two per cent on the preferred stock, payable October 1 to stock of record September 20.

Germantown Passenger Railway Company; regular quarterly dividend, payable by Guarantee Trust Company, of Philadelphia, on October 5.

Houghton County Traction Company; semiannual dividend of $3 per share on preferred stock, and initial dividend of $2 per share on common stock, payable October 1.

Massachusetts Lighting Companies; regular quarterly dividend of one-and-one-half per cent, payable October 15 to stock of record October 1.

Otis Elevator Company; regular quarterly dividend of one-and-one-half per cent on the preferred stock, payable October 15 to stock of record September 30.

Public Service Corporation of New Jersey; quarterly dividend of one-and-one-fourth per cent, putting stock on five per cent basis, an increase of one per cent in yearly rate.

Tri-City Railway and Light Company; quarterly dividend of one-and-one-half per cent on the preferred stock, payable October 1 to stock of record September 21.

Washington Water Power Company; regular quarterly dividend of one-and-three-fourths per cent; payable October 1 to stock of record September 15.

NEW YORK.

	Sept. 20.	Sept. 13.
Allis-Chalmers common	15⅝	14⅞
Allis-Chalmers preferred	52	51½
Amalgamated Copper	83¾	78⅛
American Tel. & Cable	*80	*80
American Tel. & Tel.	142¼	140¼
Brooklyn Rapid Transit	80⅝	77
General Electric	167½	165
Interborough-Metropolitan common	14⅞	14
Interborough-Metropolitan preferred	48	45½
Kings County Electric	131	130
Mackay Companies (Postal Telegraph and Cables) common	85¼	81
Mackay Companies (Postal Telegraph and Cables) preferred	74½	73¾
Manhattan Elevated	143	142
Metropolitan Street Railway	20	20
New York and New Jersey Telephone	123½	137

NEW YORK—Continued.	Sept. 20.	Sept. 13.
U. S. Steel common	83¼	79
U. S. Steel preferred	127⅛	125½
Western Union	79½	76
Westinghouse common	86¼	84½
Westinghouse preferred	130	130

*Last price quoted.

BOSTON.	Sept. 20.	Sept. 13.
American Tel. & Tel.	142¼	140¼
Edison Elec. Illuminating	252	254
General Electric	167½	165
Massachusetts Electric common	17	16
Massachusetts Electric preferred	80	77
New England Telephone	137	134
Western Tel. & Tel. common	11	10
Western Tel. & Tel. preferred	89	88

PHILADELPHIA.	Sept. 20.	Sept. 13.
American Railways	46	46
Electric Company of America	12	12
Electric Storage Battery common	62	62½
Electric Storage Battery preferred	62	62½
Philadelphia Electric	12½	12¾
Philadelphia Rapid Transit	27¼	29⅞
Philadelphia Traction	88¾	91
Union Traction	52½	53½

CHICAGO.	Sept. 20.	Sept. 13.
Chicago Railways, Series 1	110	110
Chicago Railways, Series 2	36	36¾
Chicago Subway	13	16
Chicago Telephone	131	130
Commonwealth Edison	121	120
Metropolitan Elevated common	15½	15⅛
Metropolitan Elevated preferred	48½	48½
National Carbon common	96¾	95
National Carbon preferred	118½	119

PERSONAL MENTION.

GEORGE A. McKINLOCK, president of the Central Electric Company, Chicago, visited New York last week, accompanied by his son Alexander, who took up his winter's studies in the East, September 22.

J. J. FOWLER, for many years identified with telephone interests in New Orleans, La., was a recent visitor to New York. Mr. Fowler is now secretary of the Board of Civil Service Commissioners of the City of New Orleans.

JULIUS BERNSTEIN, who was for many years associated with the Leeds & Northrup Company, of Philadelphia, is now connected with the department of electrical measuring instruments of Queen & Company, Inc., also of Philadelphia, Pa.

CHARLES B. PRICE, president of the Pettingell-Andrews Company, Boston, was a New York visitor last week. Mr. Price is also largely interested in the Price-McKinlock Company, of Boston, which does a large business in the manufacture of special modern lighting fixtures.

FRANK L. PERRY gave a demonstration of the utilization of wireless telegraphy in aerial navigation before the Engineer's Council of the Royal League, in the Masonic Temple, Chicago, Monday evening, September 20. Mr. Perry exhibited a perfect model of the Wright aeroplane, and, at the close of his lecture, further enlightened his audience by answering questions concerning both wireless and aviation.

J. J. MULLIN, vice-president of the Moloney Electric Company, of St. Louis, Mo., manufacturers of the well-known Moloney Transformers, recently returned from a six weeks' trip to the Pacific Coast and nearby states. Mr. Mullin found business conditions better than on any of his previous trips, and found the outlook for business very good. A great many plants which Mr. Mullin visited are enlarging their capacity or making other improvements. Mr. Mullin succeeded in adding a surprisingly large number of new customers to the Moloney company's books on his trip.

ROBERT I. TODD has been elected general manager of the Terre Haute, Indianapolis & Eastern Traction Company's system by the directors to succeed Charles C. Reynolds, who died last May. Mr. Todd was born in New Jersey in 1869, was graduated in the electrical engineering department of the John Hopkins Institute of Baltimore, and has served in the capacity of master mechanic, superintendent and vice-president with the several electric railroads with which he has been affiliated in the past. Mr. Todd came to Indianapolis six years ago to become general manager of the Indianapolis Tractional and Terminal Company and now the interurban lines have been added to his work. Mr. Todd is a successful traction man and his promotion is regarded as commendable and deserving. S.

PROPOSALS.

LIGHTING SYSTEM, FORT MYER, VA.—Sealed proposals, in triplicate, will be received at the office of the Constructing Quartermaster, October 13, 1909, for the interior electric wiring of forty-four buildings, including fixtures, and the installation of a complete outside distributing system for the post. Alternate bids are asked for underground and overhead distributing system. Certified check or surety company's guarantee for ten per cent of the amount must accompany the bid. Plans and specifications will be furnished upon application. A deposit of $10 must accompany the request to insure their safe return. Proposals should be indorsed on the envelope "Proposals for Electric Lighting System," and addressed to Capt. Warren W. Whitside, Constructing Q. M.

POST OFFICE, LEAD, S. D.—The office of Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., October 26, 1909, for the construction (complete) of the United States Post Office at Lead, S. D., in accordance with the drawings and specifications, copies of which may be had at the office of the postmaster at Lead, S. D., or at the Supervising Architect's office.

POST OFFICE, COLUMBUS, MISS.—The Supervising Architect, Washington, D. C., will receive sealed proposals October 22 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Columbus, Miss., in accordance with drawings and specification, copies of which may be had from the custodian of site at Columbus, Miss., or at the Supervising Architect's office.

POST OFFICE, PITTSFIELD, MASS.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., October 25, for all the labor and materials required for the construction (complete) of the United States Post Office at Pittsfield, Mass., in accordance with the drawings and specification, copies of which may be had at the office of the postmaster at Pittsfield, Mass., or at the Supervising Architect's office.

POST OFFICE, HOBOKEN, N. J.—The Supervising Architect, Washington, D. C., will receive sealed proposals October 21 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of an extension, remodeling, etc., to the United States Post Office at Hoboken, N. J., in accordance with drawings and specifications, copies of which may be obtained from the custodian at Hoboken, N. J., or at the Supervising Architect's office.

POST OFFICE AND COURT HOUSE, LA CROSSE, WIS.—The Supervising Architect, Washington, D. C., will receive sealed proposals on October 18 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of an extension, remodeling, etc., to the United States Post Office and Court House at Lacrosse, Wis., in accordance with drawings and specifications, copies of which may be obtained from the custodian at Lacrosse, Wis., or at the Supervising Architect's office.

NEW PUBLICATIONS.

THE GENERATOR—The September number of this publication, issued by the students of the New York Electrical School, contains some interesting articles written by students and graduates of this school.

LIGHTING RATES IN OHIO—Secretary D. L. Gaskill, of the Ohio Electric Light Association, has collected and compiled a mass of data relating to the electric-lighting rates prevailing in about 120 cities and villages of Ohio. These data have been published in pamphlet form by the association as of date of August, 1909. Each central-station company is given a separate section classified alphabetically by towns and in each section the first paragraph relates to the street-lighting rates and the second to the commercial lighting rates. This pamphlet of twenty-eight pages is a very valuable one for central-station companies.

TUNGSTEN ORES IN CANADA—A report on the "Tungsten Ores of Canada," by Prof. T. L. Walker, of Toronto University, has just been issued by the Department of Mines of Canada. The report covers fifty-six pages and includes fifteen illustrations. Among the rare metals which have recently become of commercial value, tungsten is an important one, both on account of its recent application as a filament in incandescent lamps, and its use in the manufacture of tungsten steel, to which it imparts great elasticity and tensile strength. The known occurrences of tungsten ores throughout the world are comparatively few, which fact lends additional interest to some discoveries of scheelite (an ore of tungsten) which have been made within the past year or two in Nova Scotia. These, together with other occurrences of tungsten ores in Canada, have been made the subject of the present report. The several occurrences of tungsten ore in Canada are described in detail, and a general statement is given on the geological occurrence of the ores, chemical tests, concentration, the uses of the metal, producing mines in other countries, statistics of the world's production, etc., while a very useful bibliography of the literature on Canadian and United States occurrences is added.

ELECTRIC SMELTING OF IRON ORES—As a sequence to the reports on "Electric Smelting of Iron Ores," published in 1904, 1906 and 1907, the Department of Mines of Canada has just issued the results of "An Investigation of an Electric Shaft Furnace," in operation at Domnarfvet, Sweden. The investigation was made by Dr. Eugene Haanel in December, 1908, on the

invitation of the inventors, and the results given represent some of the latest developments of the electric smelting of iron ores. The report contains thirty-eight pages and is divided into four parts. Part I deals with the Domnarfvet furnace, the trial runs and the comparative costs of production of pig iron by the furnace. The other three parts, which are more of the nature of appendices, describe: (1) a new electric furnace for the manufacture of steel, (2) the manufacture of electrodes, (3) methods of manufacturing wood charcoal, this material being used to supply the carbon which enters into the composition of pig iron manufactured by electric smelting. Three full-page plates, from photographs, and numerous drawings illustrate the descriptive matter of the book, which, taken in conjunction with the reports previously published by the Mines Branch on the subject of electric smelting, adds materially to the literature on the electrometallurgy of iron. This report and the preceding one on tungsten ores may be obtained on application to Dr. Eugene Haanel, Director of Mines, Department of Mines of Canada, Ottawa.

THE MUNICIPAL SCHOOL OF TECHNOLOGY AND MUNICIPAL SCHOOL OF ART, MANCHESTER, ENGLAND—The calendar for the 1909-1910 session has just come to hand. This publication of 534 pages is published at the nominal price of six pence (twelve cents) and contains an account of the remarkable educational opportunities offered at surprisingly low figures to the youth of the great manufacturing district of which Manchester is the center. A partial list of some of the full-page illustrations in the book will give some idea of the scope of this great municipal technological institution, some of the departments being apparently on the scale of prosperous manufacturing concerns. The list is as follows: General view of the main building; entrance hall; plans of floors; hydraulics laboratories; materials testing laboratories; advanced physical laboratories; electro-technical laboratories; plumbing and sanitary engineering laboratories; main inorganic chemistry laboratories; department for bleaching, dyeing, printing and finishing textile goods and for paper manufacture dyeing laboratories; brew house; paper-making machine; cotton-spinning room; textile testing laboratories; photographic studio; examination and main lecture hall; applied mechanics laboratories; engineering workshop; electrical engineering laboratories; wood-working department; interior of dye-house; bakery; bread-making equipment of bakery; water-analysis laboratory; machine room, typographical department; composing room and linotype machine; bindery; main weaving shed; pattern weaving shed; the Municipal School of Art; textile court and museum; textile court of the Arts and Crafts Museum; art room; workshop for stained glass and repoussé work. There are courses both for day and evening work and the subjects of instruction cover practically the whole field of education, the arts and sciences, technology, trades and handicrafts, making the institution a polytechnic in the fullest sense of the word. As the school is affiliated with the University of Manchester (formerly the Owens College of the Victoria University), students may compete for the technical science degrees of that university as internal students.

EDUCATIONAL NOTE.

WEST RALEIGH (N. C.) AGRICULTURAL AND MECHANICAL COLLEGE RECORD—The Department of Electrical Engineering has issued Vol. 1, No. 8, of the College Record, in which is given an account of the physical and electrical equipment, with illustrative halftones, and lists of the subjects of instruction and of the faculty.

INDUSTRIAL ITEMS.

F. W. PARDEE, Chicago, Ill., is distributing a mailing card containing a description of the Paragon ground cone, which he manufactures.

THE ELECTRICAL ALLOY COMPANY, Morristown, N. J., has recently published a circular devoted to a description of its resistance wire.

THE BUCKEYE ELECTRIC COMPANY, Cleveland, Ohio, is distributing bulletin No. 8-A, devoted to miniature and low-voltage tungsten lamps.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., has issued a revised price list showing a reduction in the prices of the Columbia tungsten lamps.

THE GRAY TELEPHONE PAY STATION COMPANY, Hartford, Conn., has published a book of testimonials from pleased users of its pay station equipment.

THE CUTTER COMPANY, Philadelphia, Pa., is distributing an advertising calendar which announces a new era of prosperity for Cutter circuit-breakers.

GENERAL C. EDWARD MURRAY, treasurer of the Crescent Insulated Wire and Cable Company, of Trenton, N. J., was in Chicago this week and made a call upon his representative, the Metropolitan Electrical Supply Company, which carries large stocks of the Crescent wire. General Murray is well satisfied with the business outlook for the fall and winter and thinks everything looks quite favorable.

THE PHELPS MANUFACTURING COMPANY, Detroit, Mich., is distributing an attractive folder containing an illustration of the use of the "any-angle" dressing fixture.

THE COATES CLIPPER MANUFACTURING COMPANY, Worcester, Mass., is distributing bulletin No. 22, describing and illustrating the various applications of Coates Unit link, flexible shafting.

THE AMERICAN ELECTRICAL HEATER COMPANY, Detroit, Mich., is distributing a small folder-price-list describing the "Superior" six-pound electric iron, which possesses several commendable features.

THE WESCO SUPPLY COMPANY, of St. Louis, Mo., has just published the lighting number of its "Price Current and Discount Sheet," which contains some interesting suggestions on lighting material.

THE NATIONAL METAL MOLDING COMPANY, Pittsburgh, Pa., is distributing a mailing card containing a photograph of a new mammoth office building in which "Sherarduct" conduit has been installed.

THE ARROW ELECTRIC COMPANY, Hartford, Conn., announces that it has purchased the entire capital stock of the Marshall Electric Company, which corporation will be operated under the name of the first-named company.

THE CENTURY ELECTRIC COMPANY, St. Louis, Mo., manufacturers of single-phase, self-starting motors, announces that it has opened an office at 315 Hudson Terminal, 30 Church Street, New York, N. Y., in charge of H. B. Steele.

THE KEYSTONE LUBRICATING COMPANY, Philadelphia, Pa., has sent Harold D. Buzby, its secretary, on a two months' tour of the company's western branches, including Chicago, Denver and San Francisco, and other smaller sales offices.

THE AMERICAN SHIP WINDLASS COMPANY, Providence, R. I., has been favored with an order for fourteen, seven-retort stokers of the Taylor gravity underfeed pattern, to be installed in the Christian Street Station of the Philadelphia Electric Company.

THE LUCAS PUMP COMPANY, Dayton, Ohio, manufacturers of standard power pumps, announces that J. W. Good, a prominent business man, has been elected to fill the position of treasurer made vacant by the resignation of R. E. De Weese, who is taking a trip abroad.

THE REMINGTON TYPEWRITER COMPANY, owing to increase of business, has found it necessary to enlarge the capacity of its factory at Ilion, N. Y., and orders are to be placed for an additional power unit and for machine-tool equipment amounting to about $50,000.

THE WAGNER ELECTRIC COMPANY, St. Louis, Mo., has recently issued Bulletin No. 87, entitled "Generators and Synchronous Motors." This publication deals quite fully with the construction of polyphase generators and motors, and contains some interesting illustrations and data.

THE UNION SWITCH AND SIGNAL COMPANY, Swissvale, Pa., is distributing an expensively bound catalogue and price list devoted to its interlocking and signaling devices. It contains a large number of general drawings, showing the construction and applications of their product.

THE GENERAL VEHICLE COMPANY, Long Island City, N. Y., manufacturer of commercial electric vehicles, has established a branch in Chicago, Ill. P. C. Chrysler, for a long time with the Ranier Motor Company, and later with the American Locomotive Company, has been appointed western manager, with headquarters in Chicago.

THE IRON AGE—Announces that the business of the David Williams Company, publishers of "The Iron Age," has been taken over by a group of publishers, including Charles T. Root, Charles C. Phillips, I. A. Mekeel and William H. Taylor, the latter until recently the publisher of "The Engineer." No change in policy or in the important personnel of the office is contemplated.

THE BRISTOL COMPANY, Waterbury, Conn., is distributing bulletin No. 111, devoted to a description of Bristol's Class II Recording Thermometers, as especially adapted for feed-water temperature. This publication should be particularly interesting on account of three sample record charts, contained therein, showing records of actual feed-water temperatures.

DATES AHEAD.

Kansas Gas, Water, Electric Light and Street Railway Association. Next meeting, Wichita, Kan., September 23-24.

Illuminating Engineering Society. Annual convention, New York, N. Y., September 27, 28 and 29.

Association of Car Lighting Engineers. Annual meeting, Chicago, Ill., October 4-7.

American Street and Interurban Railway Association. Annual convention, Denver, Colo., October 4-9.

Colorado Electric Light, Power and Railway Association. Annual convention, Denver, Colo., October 7, 8 and 9.

Railway Signal Association. Annual meeting, Louisville, Ky., October 12-14.

Western Association of Electrical Inspectors. Annual meeting, Detroit, Mich., October 26, 27 and 28.

Alabama Light and Traction Association. Annual convention, Birmingham, Ala., November 15 and 16.

American Association of Electric Motor Manufacturers. Next meeting, St. Louis, Mo., November 15 and 18.

Empire State Gas and Electric Association. Annual convention, New York city, November 17 and 18.

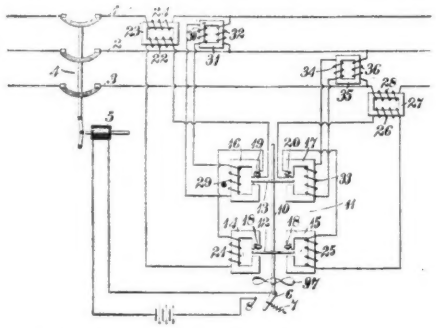
RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) September 14, 1909.

933,737. VENTILATING-PLATE AND SPACING-BLOCK FOR ELECTRIC APPARATUS. Jesse A. Baird, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed November 3, 1906. Spacing fingers dovetail into holes in a plate and are locked to the latter by a displaceable device.

933,746. OVERLOAD AND REVERSE CURRENT RELAY DEVICE. Frank Conrad, Edgewood Park, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed May 8, 1905. A movable member is provided with means for applying to it forces respectively proportional to (1) the product of the current, voltage and power factor of a circuit; (2) the square of the current; (3) the square of the voltage.

933,747. OVERHEAD-LINE MATERIAL FOR ELECTRICAL RAILWAYS. Harry P. Davis, Pittsburg, Pa., assignor, by mesne arrangements, to Westinghouse Electric and Manufac turing Company. Filed November 8, 1907. A section-break device for trolley conductors comprises an insulating bar, end brackets or clamping members, an intermediate member of conducting material, and a number of switch blades independently supported by the intermediate member.



933,746.—OVERLOAD AND REVERSE CURRENT RELAY DEVICE.

933,756. ELECTRIC SIGNAL. Winthrop K. Howe, Rochester N. Y., assignor to General Railway Signal Company, Gates, N. Y. Filed March 18, 1908. An oscillating motor-driven disk covers and uncovers apertures in the cover plate of the main casing of the apparatus.

933,765. WINDING FOR ARMATURES OF DYNAMO-ELECTRIC MACHINES. Benjamin G. Lamme, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed November 3, 1906. A dynamo-electric machine having a field-magnet winding in which the number of poles may be changed, has a winding for the armature, which has a number of coils, the pitch of which is intermediate the polar pitches for the respective different numbers of poles.

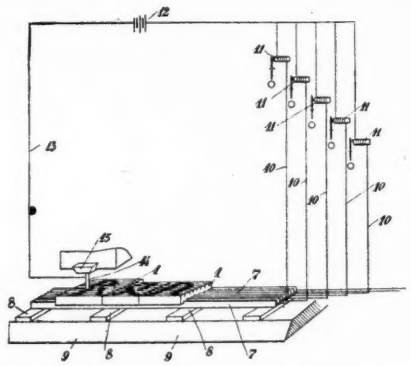
933,767. ALTERNATING-CURRENT-TRANSFORMER REGULATOR. Albert C. Lasher, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed November 26, 1906. Comprises a core member, a supporting frame therefor and a pair of movable coils, a pair of adjustably mounted rocking beams, cords for suspending the coils from the ends of the beams, and means for adjusting the connections between the cords and the coils.

933,769. ARC LAMP HAVING MAGNETIZABLE ELECTRODES. George M. Little, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed May 10, 1906. In combination with an arc-lamp electrode that contains mag netizable material, are means for neutralizing magnetism that may be produced therein by external means comprising an electromagnet winding that surrounds the electrode.

933,770. ARC LAMP. George M. Little, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed May 10, 1906. In combination with the electrodes and an inclosing casing therefor, are means for causing the drafts that enter the casing to revolve about an approximately vertical axis adjacent to the inner surface of the casing.

933,787. FUSE RECEPTACLE. Bertrand P. Rowe, Wilkinsburg, and Samuel M. Kintner, Pittsburg, Pa., assignors to Westinghouse Electric and Manufacturing Company. Filed September 20, 1906. An insulating receptacle containing insulating fluid has a cover provided with a vent opening and a shield for the opening, separable circuit terminals within the receptacle, and an inclosed fuse device connected between the terminals.

933,792. COIL-WINDING APPARATUS. Harold B. Smith, Worcester, Mass., assignor to Westinghouse Electric and Manufacturing Company. Filed May 9, 1907. A horizontally rotatable drum has an end flange and is provided with an insulating sleeve or spool, a ring having a diagonal slot in its inner surface fits loosely over the sleeve or spool, and means are provided for exerting a constant force upon the ring to move it toward the flange.



933,805.—ELECTRICAL PATTERN FOR THE MANUFACTURE OF JACQUARD CARDS.

933,800. SECTION-BREAK INSULATOR. Theodore Varney, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed June 4, 1906. Describes a supply-line section-break device for sliding trolleys.

933,805. ELECTRICAL PATTERN FOR THE MANUFACTURE OF JACQUARD CARDS. Paul Weissenborn, Barmen, Germany, assignor to the firm of Kruse et Breying, Barmen, Germany. Filed January 9, 1908. The formation of the holes in the cards is electrically controlled.

933,815. ELECTRIC FURNACE. Thaddeus F. Baily, Alliance, Ohio. Filed October 13, 1908. Describes a form of electrode furnace.

933,824. TELEPHONE STAND. Charles S. Coom, Rockledge, Pa. Filed April 8, 1909. A normally horizontal switch-controlling arm attached to the telephone stand supports at right angles an arm adjustably grasping the receiver.

933,826. INTERMITTENT LINE SWITCH. Elmer E. F. Creighton, Schenectady, N. Y., assignor to General Electric Company. Filed October 31, 1907. An electrolytic lightning arrester has a spark-gap in series therewith, and a switch for closing the spark-gap at will.

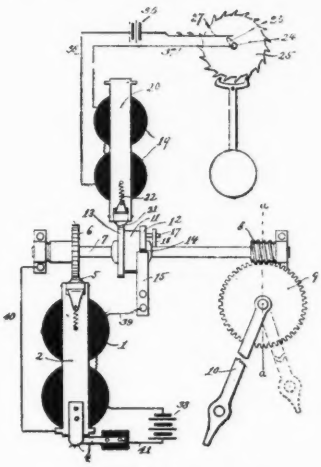
933,827. ADJUNCT FOR ALUMINUM-CELL LIGHTNING ARRESTERS. Elmer E. F. Creighton, Schenectady, N. Y., assignor to General Electric Company. Filed August 7, 1907. In combination with line conductors of a transmission system, are an electrolytic lightning arrester, a resistance, a low inductance path in parallel with the resistance, and switching means for including the resistance in circuit with the arrester between line and line.

933,838. DEVICE FOR FASTENING TELEPHONES TO WALLS. Jonathan B. Horton, Elkin, N. C. Filed November 13, 1906. A single piece of wire is formed into a pointed screw at one end and bent over on itself to resemble the wing of a butterfly nut, at the other end.

933,845. ARRANGEMENT FOR INDICATING AND RECORDING PERMANENTLY THE MAXIMUM DEMAND FOR ELECTRICAL ENERGY ON ANY CIRCUIT. William W. Lackie and David J. Steele, Glasgow, Scotland. Filed January 31, 1908. In combination with an electric meter, are a solenoid, a beam pivotally mounted adjacent to the solenoid and carrying a magnetic plunger projecting into the solenoid, a wheel rotatably mounted upon the beam and adapted to be brought into driven relation with the meter, and means for exerting a gradually augmented pull upon the wheel tending to pull the wheel out of engagement with the meter.

933,854. SECTIONAL POLE. Oliver O. M. Sciple, Minneapolis, Minn. Filed April 10, 1908. A built-up steel pole has means for lowering the electric-light bracket to make the lamp accessible from the ground.

933,887. CLUSTER FIXTURE FOR ELECTRIC LIGHTS. John H. Caldwell, Philadelphia, Pa. Filed October 21, 1908. Comprises a hanger with a base secured to it, lamp sockets on the upper face of the base, lamps in the sockets, a switch on the lower face of the base, a bail secured to the base, and a lamp shade supported by the bail and surrounding the base.



933,899.—ELECTRICALLY-OPERATED CLOCK.

933,899. ELECTRICALLY-OPERATED CLOCK. Harleigh Gillette, Chicago, Ill. Filed March 11, 1908. A secondary clock has a motor for actuating it, an electric circuit controlling the motor, a rotating circuit closer controlling the circuit, electrically actuated means controlled by a master clock and imparting movement to the circuit closer to close the circuit, and means actuated by the motor imparting secondary movement to the circuit closer to open the circuit.

933,930. ELECTROMAGNETIC SEPARATOR FOR GRAIN CHUTES. Bird M. Sypher, Toledo, Ohio. Filed June 22, 1908. An electromagnet, with a non-magnetic wiper plate extending over and engaging with it, is arranged transversely in the bottom of the chute.

933,956. ELECTRICAL SWITCH. Frank H. Buffehr, Millers, Nev. Filed May 3, 1909. Describes a reversing switch for three-phase motors.

933,989. ELECTRIC HEATER. Carl E. Johnson, Los Angeles, Cal., assignor of one-half to Wm. W. Piddington, Los Angeles, Cal. Filed January 22, 1909. In combination with an electric fan motor is an electric heating element secured thereto, the element and motor being connected in parallel, and means are provided to automatically adjust the heating element while a current is passing therethrough.

934,024. INCANDESCENT LAMP. Edward H. Smith, Aberdeen, Wash., assignor of one-half to Thomas Mitchell, Aberdeen, Wash. Filed November 30, 1908. A switch lever for multiple-filament lamps comprises a single piece of sheet metal provided with a flattened offset head adapted for pivotal connection with a lamp, this lever being provided with a narrow elongated body, the central portion of which is depressed and contracted to form a contact surface, the free end of the body being rolled upon itself to form a string-receiving eye.

934,063. SAFETY DEVICE FOR POLYPHASE-CURRENTS MACHINERY. Juan M. S. Fontecha, Mexico, Mex. Filed November 27, 1908. A safety device for triphase current machinery comprises a safety fuse in each phase, and means in each circuit, controlled and operated by the current of said circuit, for automatically short-circuiting the two other circuits upon failure of current in one circuit.

934,097. CONTROLLER FOR ELECTRIC MOTORS. Frank L. Sessions, Columbus, Ohio, assignor to The Jeffrey Manufacturing Company, a corporation of Ohio. Filed December 2, 1903. Renewed January 31, 1908. Comprises a series of pairs of movable contacts, series of co-operating pairs of stationary contacts, means for normally separating the contacts of each of the pairs, and manually controlled devices for causing the contacts of each of the pairs to become electrically connected and also for positively disconnecting them.

934,104. CONTROLLING MEANS FOR ELECTRICAL CLUTCH DRIVING MECHANISM. Abram P. Steckel, Buffalo, N. Y. Filed December 11, 1908. Two electric clutches have driving members which rotate in one direction and driven members arranged to drive machinery in opposite directions; means are provided for exciting either clutch, also means operated by the motion of the machinery when the current is cut off from the driving clutch for exciting the other clutch, whereby the latter clutch acts to retard the motion of the machinery.

934,108. ELECTRIC BURGLAR-ALARM. Max Trautmann, Dresden, Germany, assignor to Bertha Trautmann, Dresden, Germany. Filed November 21, 1908. Electrical contacts are established by a double winding roller curtain.

934,119. CIGAR-LIGHTER. Francis J. Wildemann, Newark, N. J. Filed February 10, 1909. Comprises a base forming a receptacle having a lid, a lamp mounted on the lid and adapted to form an electric conductor, an arm, means for swinging the arm, a contact to engage the lamp when the rod is swung, and means for adjusting the lamp vertically.

934,122. INITIATION-STEP. Ernest L. Woodman, Chicago, Ill. Filed May 4, 1909. Each of a flight of glass-treaded stairs contains under it an electric lamp which is put in circuit and lighted when a person treads on the stair.

934,210. DYNAMO-ELECTRIC MACHINE. William D. Pomeroy, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Filed March 6, 1905. Comprises a frame, a laminated core, a dovetail connection between core and frame, clamping bolts for holding the laminas of the core together, each bolt lying in a passageway formed between the dovetail projection and dovetail groove of the connection.

934,212. KNOCKDOWN ARMATURE. Eugene W. Presbrey, New York, N. Y. Filed May 19, 1908. Comprises shells of conducting material, a generating coil arranged intermediate the shells and revoluble relatively thereto, metallic faceplates in fixed relation to the coil and connected to the terminals thereof, and carbon rings in contact with the faceplates and shells.

934,232. CONTROLLER-HANDLE. Emmett W. Stull, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Filed June 22, 1905. The handle carries a pawl which engages with a notched member rotatably mounted on the controller shaft.

934,233. CONTROLLER-HANDLE. Emmett W. Stull, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Filed June 22, 1905. A pawl carried by the handle normally engages with a relatively fixed notched member. A slight backward movement of the handle releases the pawl and means are provided for preventing the pawl from again engaging the same notch after having been released from it.

934,236. PULL-SOCKET. George B. Thomas, Bridgeport, Conn., assignor to the Bryant Electric Company. Filed May 15, 1909. Comprises a rotary insulating block, a switch member moving therewith mounted on one side of the same, a spindle extending only to the other side of the block and means mounted on the spindle for rotating the block.

934,256. DYNAMO-ELECTRIC MACHINE. Alfred H. Wouters, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed March 1, 1907. Has a stator core, with a stator winding in it, and arc-shaped straps or bars (connecting different parts of the winding) arranged circularly end to end and supported on the end of the stator core.

934,263. ELECTROMAGNETIC PULSATOR FOR MILKING-MACHINES. Lee W. Badger and Edwin J. Badger, Bellefontaine, Ohio. Filed January 6, 1908. The plunger valve of a vacuum tube is operated by a soft-iron core arranged in the tubular core of an electromagnet.

934,284. ELECTRIC SIGNALING DEVICE. Robert V. Cheatham, St. Matthews, Ky. Filed March 31, 1908. An automatic electric signaling system comprises a signaling device having an electromagnet and a signal operable thereby, a signal-operating circuit adapted to be closed through this magnet, and a pair of controlling circuits also adapted to be closed success-

ively through the magnet and serving to operate the latter to establish the operating circuit therethrough.

934,296. TUNER FOR WIRELESS TELEGRAPHY. Halsey Dunwoody, U. S. Army. Filed July 5, 1907. Comprises an outer coil provided with a frame having a channel; an inner coil slidingly fitted in this channel and provided with terminals, and fitting the channel; and a reversing plug in circuit between the coils.

934,298. OUTLET-BOX. Thomas J. Fagen and Samuel C. Thomason, Baltimore, Md. Filed September 25, 1908. The casing is formed of sections and has a centrally disposed collar contained wholly within it for securing the casing in position; openings are provided in the walls of the casing, and means for closing these openings.

934,301. CONTROLLING DEVICE FOR ELECTRIC MOTORS. Ernst H. Geist, Cologne, Germany. Filed November 16, 1908. The motor to be regulated has its armature winding in series with the armature of a generator which has a field winding in series with its armature and also a shunt field winding. Resistances and a switching device are provided so that the field and armature circuits of the generator may be closed through the switch and the resistances inserted into and removed from the circuit of the second field winding.

934,340. SWITCH. Ole P. Noisom and Carl J. Lindewald, South Bend, Ind.; said Lindewald assignor of one-fourth of the entire right to said Noisom. Filed September 19, 1908. An electric time switch comprises clock mechanism, a switch-operating power spring, a movable switch element, means including a trip for locking and unlocking the power spring, a bearing interposed between the power spring and switch and embodying a train of gears, a movable support on which said gears are mounted, and means for fastening this support when adjusted.

934,352. LINE-WIRE CONNECTOR. John S. Pratt, U. S. Army. Filed November 24, 1908. Has terminal hooks and a central portion of a width exceeding the width of the curved portion forming the hooks, the central portion being formed to provide a lateral offset rib arranged on the inner surface of the curve.

934,369. VENTILATING PLATE AND SPACER FOR ELECTRICAL APPARATUS. Harry D. Summers, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed October 24, 1906. The plate has oblong holes and strips or figures, each of which consists of two end portions disposed in approximately parallel planes and an intermediate portion having a lateral projection that fits into the corresponding oblong hole and is upset against the back of the plate, all of the finger portions being in planes which are substantially perpendicular to the face of the plate.

934,385. APPARATUS FOR THE ELECTROLYSIS OF ALKALI CHLORIDS. Jean Billitzer, Vienna, Austria-Hungary. Original application filed January 22, 1907. Divided and this application filed June 17, 1908. Comprises a trough, a bell within the trough adapted to contain the electrolyte and the anode, a cathode net suitably disposed across the lower opening of the bell and a diaphragm upon the net comprising a layer of asbestos cloth and a mixture of sulphate of barium with asbestos wool disposed upon the cloth to form a layer.

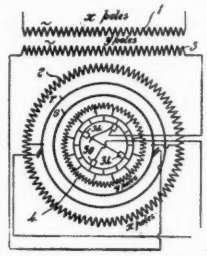
934,390. OVERLOAD AND REVERSE CURRENT RELAY DEVICE. Frank Conrad, Swissvale, Pa., assignor to Westinghouse Electric and Manufacturing Company. Original application filed May 8, 1905. Divided and this application filed October 24, 1906. Renewed January 25, 1909. Includes a movable conducting member and a magnetizable core comprising a yoke and pole-pieces adjacent to the conducting member, a magnetizing winding located on the yoke of the core, a second winding located on the yoke of the core, a winding connected in closed circuit with the second winding and located on the pole-pieces, and a third winding located on the yoke of the core in proximity to the second winding.

934,391. OVERLOAD AND REVERSE CURRENT RELAY DEVICE. Frank Conrad, Swissvale, Pa., assignor to Westinghouse Electric and Manufacturing Company. Original application filed May 8, 1905. Divided and this application filed March 15, 1909. Similar to the preceding.

934,396. SIGNAL-BELL. Harold W. Eden, Detroit, Mich., assignor to P R Manufacturing Company, Detroit, Mich. Filed December 7, 1908. Describes an electric bell.

934,405. DYNAMOELECTRIC MACHINE. Louis J. Hunt, Sandycroft, near Chester, England. Original application filed June 22, 1906. Divided and this application filed May 20, 1907. Comprises a stationary part and a rotary part, a winding on the stationary part adapted to be connected to a source of electric supply, a winding on the rotary part, a second winding on the stationary part, a commutator on the rotary part, brushes on the commutator, connections joining the brushes, the winding on the rotary part, and the second winding on the stationary part in series, and a second winding on the rotary part joined to the commutator.

934,420. AUTOMATIC WEIGHING-MACHINE. Thomas R. Weyant, New York, N. Y. Filed September 25, 1906. Comprises a scale, a hopper having a main delivery spout and a drip spout for discharging into the scalepan, an automatically closing valve for controlling the flow of material through the main spout, an electric motor for opening the valve, a valve for controlling the flow of material through the drip spout, an electric motor for controlling the last-named valve positively to open and close the drip spout, and circuits controlled by the movement of the scalepan for operating the electric motor.



934,405.—DYNAMO-ELECTRIC MACHINE.

934,421. INDICATOR FOR SWITCHES. Charles A. Clark, Hartford, Conn., assignor to Trumbull Electric Manufacturing Company, Plainville, Conn. Filed September 21, 1908. The indicator comprises a disk having a central and two diametrically opposed perforations bearing, on its upper face, a plate of distinctive color differing from the disk and extending across the plate, the indicator plate having perforations registering with the perforations of the disk, a plate on the lower face of the disk having registering perforations and means for securing the disk and plates together with the perforations in registering position.

REISSUE.

13,020. APPARATUS FOR REFINING COPPER. Frank L. Antisell, New York, N. Y., assignor of one-fourth to William S. Higgins, Perth Amboy, N. J. Filed April 3, 1908. Original No. 875,641, dated December 31, 1907. A device for electrolytically refining copper comprises a tank adapted to contain an electrolyte, an anode and a cathode suspended in the electrolyte, a frame suspended in the electrolyte between the anode and the cathode, and a removable porous non-conducting diaphragm carried by the frame.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 20, 1909:

482,719. CONDUIT FOR ELECTRIC RAILWAYS. Francis O. Blackwell, Boston, Mass.

482,724. ELECTROLYTIC APPARATUS. Thomas Craney, Bay City, Mich.

482,753. INSULATED ELECTRIC WIRE. Thomas L. Reed, Providence, R. I.

482,778. ELECTRIC SIGNALING DEVICE FOR FIREMEN. George L. Barnard, Milwaukee, Wis.

482,780. SIGNAL TELEGRAPH. Claudius V. Boughton, Buffalo, N. Y.

482,825. ARMATURE WINDING FOR DYNAMO-ELECTRIC MACHINES. Rudolf Eickemeyer, Yonkers, N. Y.

482,863. ELECTRIC LOCOMOTIVE. Conrad M. Conradson, Madison, Wis.

482,936. ELECTRIC SWITCH AND CASE. Augustus Wright, Providence, R. I.

482,964. ELECTRIC-RAILWAY CONDUIT. Rudolph M. Hunter, Philadelphia, Pa.

482,986. ELECTRIC ARC LAMP. James A. Stuart, Philadelphia, Pa.

482,993. CLOSED CONDUIT FOR ELECTRIC RAILWAYS. Levi P. Bunce, Minneapolis, Minn.

483,061. TROLLEY STAND FOR ELECTRIC RAILWAYS. John C. Hough, Pittsburg, Pa.

483,074. JOINT FOR ELECTRIC CONDUCTORS. Joseph W. Marsh, Pittsburg, Pa.

483,108. ELECTRICAL STOP VALVE. Adolf Franke, Berlin, Germany.

483,123. CIRCUIT SWITCH. George W. Russell, Jr., and Daniel B. Minor, Denver, Colo.